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LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

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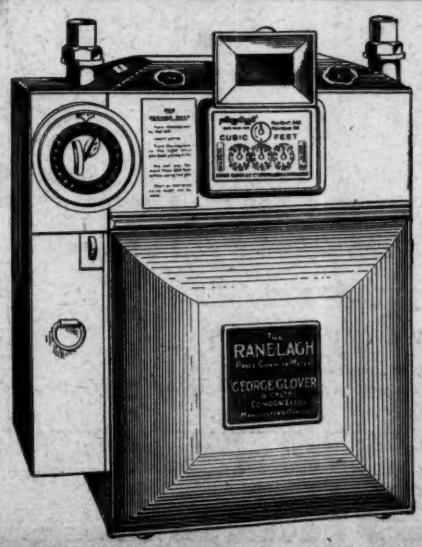

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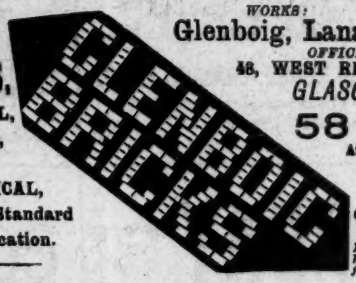

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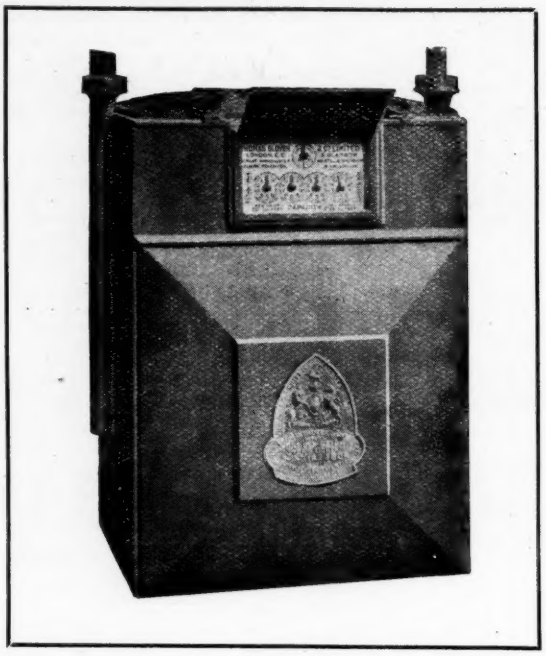

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VOL. CLX., No. 3100.] WEDNESDAY, OCTOBER 11, 1922. [74TH YEAR.

EDITORIAL NOTES.

In a Quandary.

THE high gas accounts and therm controversy in the newspapers has at length reached a perfectly farcical stage. Such was a destiny that could not be avoided. It was bound to be so as gas undertakings found themselves in a position to reduce their prices, which, in the case of sliding-scale or basic price companies, they are bound to do before they can take anything in the way of additional dividend. The "Daily Mail" to-day finds itself in a quandary. All through the piece it has been blaming the therm for those comparatively few gas accounts of which there was complaint, though it was incapable of explaining why there should in the circumstances be gas accounts that did not show an increase. But it was the therm, and nothing but the therm, that was (according to the short-sighted and narrow-minded "Daily Mail") at the bottom of all the mischief. Our curious morning contemporary has never understood the therm, and so probably never will. It simply looks upon it as a fickle jade that is not to be trusted; it is too obtuse to appreciate that the therm is simply a constant physical quantity multiplied by 100,000. Because it did not understand, it attacked the therm; and it is reluctant to let go its hold, although it is now being demonstrated that, with reductions of the price per therm, gas consumers' accounts are on the decline. This does not suit the books of our contemporary. It is proving how extraordinarily foolish it has been. It has had letters from consumers who tell it that their accounts have dropped in the July to September quarter. Those consumers are apparently inclined to be just to their gas suppliers; but the "Daily Mail," we rather fancy, see in this nothing more than some further hokey-pokey on the part of the therm or of its vendors. Some people have a strong propensity for measuring other people by their own bushel. Gas companies are kept very tightly within bounds by statutory enactments; the "Daily Mail" is not. It now talks of "mysterious" decreases in gas accounts, just as it was recently talking of "mysterious" increases in gas accounts; and the therm was, and still is, the supposed cause. In its imagination, if the therm is guilty of causing increases in gas accounts, there is no reason why such a nimble thing should not be guilty (without any aid) of causing reductions. These, if fictitiously occasioned, would, of course, be highly detrimental to the gas suppliers. So our contemporary still urges the necessity for a Board of Trade inquiry, and suggests the probability of one general inquiry into the whole matter. If this happens, and the gas companies' books disclose that the aggregate consumption of gas and the income from gas ascended in the June quarter by only normal percentages, and not by the percentages that a few exceptional gas bills showed, the charges against the therm will require some explanation—not by the gas companies, but by the consumers themselves. Should an inquiry be held, it is hoped that the local authorities, or those who will represent the complaining consumers—we should much like the Editor of the "Daily Mail" to be selected as a witness—will be prepared to meet the disclosures as to the gas companies' actual trading results.

Not all newspapers have been so silly over the therm question as the "Daily Mail" and some of our electrical contemporaries. Several gas companies have given notification of further reductions in the price per therm. Some papers think this due to the pressure of agitation; while the fact is the reductions are properly attributable to quite ordinary circumstances. Gas undertakings have been busy rectifying the ravages on their plant of the enforced neglect of wartime, and bringing it up to pre-war standards of efficiency; they have been retrieving the loss occasioned by costly purchases of coal to maintain the gas supply during the three months' coal stoppage (it cost the Gas Light Company about £500,000 and the South Metropolitan Company upwards of £330,000); and they have had to let conditions sink down to a new base in respect of the costs of raw materials and labour. These are among the adverse circumstances from which gas undertakings are emerging, and so are able to announce reductions. There is nothing mysterious about this. The Gas Light and Coke Company have announced a further 1d. reduction—making the price 10d.; and the South Metropolitan Company, whose price is also 10d., have indicated the likelihood of an early extra reduction on their part. The "Daily Chronicle" has, in a leading article, been induced by the lowering of gas accounts last quarter, and the intimation of additional reductions, to point out to its readers that it was dear gas and not therms that made heavy gas accounts. Of course, dear gas will contribute to high gas accounts; but the most robust contributor to them is the gas consumer himself or herself. We will quite frankly admit that the price of gas has been high, but not any higher than the circumstances warranted, until matters had more or less righted themselves. The "Chronicle" perhaps does not love the "Daily Mail." But it says the agitation against therms has been an extreme instance of a newspaper "stunt." "To object to "therms as against cubic feet is as absurd as to object to a "shilling as against twelve pence." There is sense in that, and in this: "Any consumer who retains the amount of "arithmetical skill that is imparted in the third standard "of an elementary school can sit down and convert his bill "for therms into terms of cubic feet, without the least "trouble." And our contemporary arrives at the conclusion that the "stunters have been flogging the wrong horse."

Now that we seem to be at the dawn of public recognition by the newspapers of the common sense of the matter, now that the "Daily Mail" is in a quandary, and cannot explain why the therm should operate in producing sporadic high gas accounts one quarter and generally lower accounts the next despite price reductions, there is good hope that gas consumers will learn to admire the therm more than ever they did cubic feet. Never within our knowledge have they shown any more love for cubic feet or for the gas-meter than they have for the rate or tax collector. They are, as time progresses, much more likely to show a greater affection for the low-priced therm, which is now getting into the same street in the matter of price as the unit of electricity for lighting purposes—only the latter has the low thermal value of 3420 B.Th.U., while the gas unit is 100,000 B.Th.U. At 10d. per therm for heating purposes, 10,000 B.Th.U. are supplied for a penny by gas companies, compared with 3420 B.Th.U. in the case of electricity—if the price of the competitor is as low as 1d. per unit. We believe that the gas-account *cum*-therm agitation is going to have an excellent effect upon the interests of the gas industry. Long ago we predicted that the therm would do so; and the conviction of that time is strengthened to-day. The therm is a commercial weapon that electrical men do not like; and they know, as we do, that people are more interested in the therm now owing to the agitation than would have been the case through any amount of propaganda by the industry itself. The immediate effects of that agitation are being wiped away by the ability to make timely reductions in therm prices.

New Works and Continuous Verticals at Carlisle.

THE years pass; but Mr. J. E. Blundell, the Engineer and Manager of the Carlisle Corporation Gas Department, is as ardent a believer as ever in the steaming of charges in Glover-West continuous vertical retorts. It was only in 1918 that he went to Carlisle; and years before that he did notable work at Macclesfield in steaming charges in such retorts. He was, in fact, one of the pioneers in this practice; and the early results that he secured, by the scientific regulation of volume and pressure of the steam and retort temperatures according to the work to be done, were highly valuable to the gas industry both at home and abroad. What was then achieved was looked upon somewhat sceptically by many colleagues in the profession; and all sorts of disadvantages were predicted. But Mr. Blundell knew what he had in hand, and was not to be discouraged. We remember well the great care with which he pursued that work. Nothing was left to chance; he persistently experimented, fully persuaded that there was substantial gain to be effected, and that to ascertain exact conditions for realizing maximum results would be worth all the supervision and labour entailed at those initial stages. Expectation was abundantly justified. There has been a great flow of water under the bridges since those times; there has been a great diversion of gas-manufacturing practice to the economies and efficiencies which steaming in continuous verticals offers to the gas maker. This means a vast corroboration of early work, to say nothing of the new knowledge that the system has contributed to gas technology. Mr. Blundell's name, like that of Mr. John West, will always be associated with inceptive work which has had such far-reaching results.

With experience of the practice built upon a foundation of such material advantage, it is not surprising that, when Mr. Blundell was transferred to Carlisle, and found there carbonizing plant—good and efficient according to the standards of the days when constructed—which was getting day by day more remote from the approved standards of these times, he should advise his Committee to adopt the system of producing gas which he had found so advantageous elsewhere. The Committee accepted the advice; and the Council endorsed it. Now to-day on the Rome Street site there stands a new works, carried out to the plans of Mr. Blundell, and the central feature is the installation of eight settings—each setting consisting of two units of four retorts, or 64 retorts in all—of Glover-West continuous verticals. The new works, with this installation, formed the basis of the highly interesting engineering address with which Mr. Blundell inaugurated his year of office as President of the North of England Gas Managers' Association, and the meeting also afforded an appropriate occasion for an official "opening" of the works. The honour of the presidential office of the Association is the present occupier's not by virtue of long residence in the district, but by professional merit in contributing to work that stands for progress.

There is no need here to draw attention to the details of the new works scheme. They are set forth in the President's Address, supplemented by other notes, as well as by reproductions of photographs and drawings. Every new works has its own problems; and the Rome Street works were no exception. Among the features, ferro-concrete pile foundations were adopted not only on account of subterranean conditions, but because Mr. Blundell is convinced there is a good deal of sound argument in favour of piling as compared with excavation work. And, speaking of ferro-concrete, we have another illustration here of very free use being made of it in different parts of the new plant. But Mr. Blundell rightly insists upon such work being placed in the hands of a qualified engineer; and when this is done, his view is—and it is the experience of others—there need be no hesitation in adopting such construction. He finds that at present prices ferro-concrete is as cheap as steel structures, and, moreover, has undeniable advantages of a substantial nature for underground work, coke-hoppers, and all installations where corrosion is a source of danger. It is noticed that the Ministry of Health are allowing twenty years as the repayment period for the part of loans spent on reinforced concrete work. In our opinion the time might be extended beyond that, but probably the Ministry prefer to be cautious.

But, of course, the central feature of the new works is the installation of verticals, the section completed having a daily capacity of 2 to 2½ million cubic feet, with ready means of extension to from 3 to 4 millions. The auxiliary plant generally has a daily capacity equivalent to 3 million cubic feet, so that there is a good margin; and it is just as well to be fairly liberal in one's ideas as to prospects, when the consumption of gas shows that constant upward course which it has in Carlisle. And consumption is likely to have an increasing rate of progress, as the provision made means an economy in production which the old type of plant could not possibly, in any circumstances, have achieved; and this economy must be reflected in the price to the consumers. As a matter of fact, in Mr. Blundell's report on the scheme, he had no difficulty in showing that, by the adoption of continuous vertical retorts, there would be a total saving annually in manufacturing costs of £16,486, or 9·89d. per 1000 c.ft.—of course, in comparison with the old carbonizing plant and methods of working; so that the saving would not necessarily apply to plant in other conditions, and working in other circumstances. Besides the productive value of the plant per ton of coal, there is the economy of labour. In this case, the number of men required on the works is 42, for a daily make of 2½ millions. That speaks volumes. Of course, as the President says in other words, production efficiency and elasticity are important points in favour of the system. It enables one to operate, in respect of qualities and productions per ton, of course within limits (which are fairly wide) just as circumstances warrant; and this with an unbroken equality of make from hour to hour. But at this time of day, with all the investigation and working experience there has been, there is no need to argue the case as to the inherent, scientifically based virtues of the system. They are all well known. To make 90 therms from a ton of coal, where only 70 therms could be produced before, is an achievement; inasmuch as, if the 70 and the 90 therms were sold at 11½d., the lower make would produce £3 6s., and the higher make £4 6s. 3d. Or put another way, the 90 therms could (*cæteris paribus*) be sold at 8·8d. (instead of 11½d.) to produce the £3 6s. obtained from the 60 therms. The 90 therms are the product of 20,000 c.ft. of 450 B.Th.U. gas, which appears to be the upper limit of the quality favoured by Mr. Blundell. But economies and values do not end there. Although there is a moderate diminution of the coke available for sale, owing to the steaming, it is claimed by Mr. Blundell that there is enhanced value in the coke, due to its physical condition and low moisture content. Improved tar and ammonia values are well-authenticated credits. In a table based on a make of 2,650,000 therms a year—making by the horizontal system 70 therms per ton, and by the process of steaming charges in vertical retorts 90 therms—he shows by the latter a net saving in the cost of coal of about £2000. These are all matters for consideration in these days of higher costs, when to economy and efficiency gas undertakings have to look very steadily and critically as being among the means for enabling them to reduce the charges to the consumers, and so give a fillip to business expansion.

All parts of the new works are more or less referred to in the address, either descriptively or in explanation of the reasons for adoption. For power purposes electricity is drawn from the Corporation cables. It is Mr. Blundell's view that where the gas and electricity undertakings are under corporation administration, current should be taken by the gas-works from the corporation cables. Perhaps this is so, as it is hardly likely a corporation would look very kindly upon a gas-works showing the local manufacturers how on the gas-works electricity can be generated cheaply for all purposes by a small private plant. Yet why they should not—seeing that in most areas there is competition in lighting, heating, and (in a weakly way) for cooking and heating water—we do not quite know. However, if municipal gas-works buy current for power purposes from within the family circle, then the electricity department should buy coke and breeze from the gas-works for steam raising. There should be reciprocity in business relations. In the case of company gas suppliers, the works electricity generating plant should be a means of demonstrating to the responsible men in other large industrial establishments in the district the economy in average cost of the provision of current for all purposes by means of a private plant.

It was a good practical address to which the members of the North of England Association listened last Friday; and the inspection of the new works added interest to it. Upon their completion and general appearance, regarded in the whole and in detail, the visitors heartily congratulated both Mr. Blundell and the contractors. The President's colleagues there saw something which some of them, through

the present conditions of their own plants, cannot at once possess; but no doubt, in thought if not in expressed words, those in that position were a bit envious of Mr. Blundell's fortunate lot. But their President has an eye on the future. One can see that he, with a confidence born of knowledge and experience, intends to justify fully the recommendation that he made to his Committee, that they should incur this considerable expenditure on the new works. Time, we feel certain, will prove the profitableness of the investment.

Favoured Declarations in Existing Circumstances.

As we remarked last week, and have often (in other words) remarked before, there is in respect of calorific power no "best quality" of gas that can be universally applied. If there were, we might just as well have a universal standard, and be done with it. The discussion at the recent Southern Association meeting at Exeter (reported last week) demonstrated this; and any responsible gas manager who reads that discussion with the view of saving himself the trouble of making determination on his own account, will simply meet with disappointment. The "best" calorific value to supply is a matter for every individual gas undertaking, by taking into account all circumstances—available coal, producing and distributing conditions, and the general character of demand. In this matter of the correct declared value, there is a mutuality of interests as between the undertaking and the consumers. But in places circumstances may necessitate something in the nature of a compromise, in view of a present incapacity to serve the interests of the consumers to the best advantage. For example, some distributing systems may be such that a gas of high calorific power must be supplied in order to get the requisite therms to the consumers in the distant parts of the area at times of peak load; and yet the discussion, other than in Mr. G. M. Gill's opening, gave a continuous stream of testimony that the highest efficiency with consumers' existing appliances was to be obtained with calorific values between 450 and 480 B.Th.U. There was testimony for calorific values below 450 B.Th.U. (for instance, by Mr. A. W. Sumner, who advocated 400 B.Th.U. gas), and testimony for values above 480 B.Th.U.; but sandwiched between the 450 and the 480 stand the majority. But be it marked that all this applies to existing plant and district conditions; and there was not a single speaker who pledged himself never to revoke present determination, should the mutations of time give the necessary warrant. Conditions are bound to change. Plant has not perpetual life; the present distribution systems will not always suffice, or last for ever; and the means of consuming gas will, by the incorporation of new ideas, be still better able to align themselves with the most advanced economies in production.

Now Mr. Gill is a free lance. His opening of the discussion made a very fair survey of the problem of the calorific value to declare, and the considerations affecting it; but Mr. Sumner supplied, in his own practical way, points that were beyond Mr. Gill's horizon, because their views do not by any means coincide. Mr. Gill did not suggest that anybody's idea was wrong as to what was the best calorific value gas to distribute. On the contrary, he admitted that self-determination in this matter is a very proper thing, and that circumstances must alter declarations. But he has a preference. In his experience high-grade gas of about 560 B.Th.U. gives excellent results, provided there is plenty of pressure at the burner-head. And he adds that insufficiency of pressure at the burner-head will mean poor efficiency and wasteful consumption. This fact, with the variety of house piping that there is in existence, is a distinct disadvantage to high-grade gas, seeing that many houses are not piped as modern practice would have them. Still, the same piping might be insufficient for low-grade gas—gas as low (say) as 400 B.Th.U.; and therefore in *present* circumstances —unless the conditions are altogether favourable—the mean between a gas that requires a high pressure at the burner-head and the gas that needs good-sized piping to ensure an adequate supply of B.Th.U., is quite prudent policy. The "present" is emphasized, because we have no inclination to bind ourselves irrevocably to one policy in the face of development of experience and progress in invention and efficiency. In adopting this attitude we retain our liberty, for such a gas is within the compass of many gas-works with water gas or complete gasification plants supplying the diluent for rich coal gas, though in the case of those works with coal-gas plant only and no means of steaming, a quality of gas in excess of 500 B.Th.U. will have to be supplied, if inerts are kept at a moderate point. And inerts have no volumetric value under the therm system; and they are a distinct detriment to productive, storage, and distribution capacity.

However, as Mr. Gill points out, good service to the consumers can undoubtedly be given by gas companies within a wide range of heating values, so long as the statutory requirements are carried out. All that has to be done in determining upon the calorific value to declare is (as Mr. Gill puts it) to make a reasoned investigation of both works and district in present circumstances. It is alleged that some undertakings did not at the inceptive stages of the therm system take into consideration the whole gamut of pertinent factors; and the result was they put their declarations too low—under existing conditions. But many of them at the time were under serious disability in regard to plant conditions, owing to the ravages of wartime, and the renewal limitations imposed by the war and subsequently, as well as the quality of coal and the price of oil. There has been a considerable change in all these respects during the past twelve months; and it is under the improved conditions that the revision of declarations has been made. There is nothing in this over which to elevate eyebrows. But the undertakings have been blamed for procedure that actually shows their wisdom; and what they have done is quite in conformity with the cardinal intentions of the Gas Regulation Act. It may be that in time to come, as developments are made and there is progressive change in conditions, these undertakings will be transferring their working to a calorific grade of gas in the neighbourhood of what Mr. Sumner advocates—400 B.Th.U. Before then, however, they will weigh well the disadvantages of low-grade gas that Mr. Gill submitted in his opening, and the advantages of the low-grade gas that Mr. Sumner prefers; together with the advantages of high-grade gas as presented by Mr. Gill, and its disadvantages as set forth by Mr. Sumner. Both sides of the picture are explained by the two painters, with their diversity of thoughts and conceptions. One of the disadvantages of low-grade gas that Mr. Gill put forward, as an example of plant value depreciation, was that a gasholder used for storing gas of 500 B.Th.U. was worth 25 p.ct. more than it would be if used for 400 B.Th.U. gas. In other words, the capital value of the plant would be lowered by reducing the calorific power of the gas. But *per contra*, with lower grade gas, there should be a reduction of the cost of the gas-producing plant and coal-handling auxiliaries. But apart from this we should be doing our own common sense a wrong if we did not consider whether, by the sacrifice of part of the capital value of members of the plant, the ultimate resultant economies would not pay over and over again. Individual considerations are necessary; but it is the final issue of the whole balance-sheet, combined with efficiency in use, about which we want to know. And Mr. Gill wishes to see the value of low-grade gas expressed in price per therm to the consumer. Unless the price is low compared with that for high-grade gas, then there is little justification for any low-grade extreme

The points raised as to the respective advantages and disadvantages of high and low grade gas need not be individually laboured. They are not new; they have been discussed over and over again. The same with reference to the use of water gas as a diluent, and the utilization of a small quantity of oil. There is nothing new there, other than personal opinions. With Mr. Gill's views as to the beneficent authorization conferred by the Gas Regulation Act there is complete agreement, though all gas men do not recognize the full and true meaning of this far-reaching enactment. It is the bridge to a larger life in the industry's service. To a certain extent we have to feel our way beyond that bridge. But investigation and fresh knowledge come to the aid of the industry; and the experiences —differing from environment, differing in results, and differing in the deductions drawn from them as exemplified in the Exeter discussion—are but the incidents in the march to better defined and more settled convictions.

The German Mantle Raid.

While it is natural that the gas-supply industry should desire to have gas-mantles as cheap as possible consistent with quality, one cannot help feeling a considerable amount of sympathy with the British manufacturers, in view of the fact that they are unable to compete on level terms with

imported mantles, which reach these shores chiefly from Germany. This is very evident from the report (the chief parts of which we publish to-day) that has been issued by the Committee, presided over by Sir Bernard Mallet, K.C.B., who have been hearing evidence regarding the complaint of the home manufacturers, under Part II. of the Safeguarding of Industries Act, as to the effect upon their industry and employment of the importation of German mantles, which importation is on the increase. Of course, it would be idle to suggest that this does not affect the home industry—its financial position, its employment capacity, and its ability further to reduce costs. It is an industry whose costs would be healthily and substantially affected by mass production.

There is a Convention in Germany comprising all the mantle makers; there is an Association here comprising the British makers. But the Association of the latter is, unaided, of no particular avail against competition from Germany. And it is abundantly clear that the makers here are the victims of the conditions that exist in Germany, where costs are much lower. In one part of the report, the Committee deliberately say that, from the accounts submitted to them (the manufacturers afforded the Committee every facility for examining the books of representative firms), it appears that the cost of materials, fuel, and power alone in the English factories exceeds the exchange value of the total costs of manufacture in Germany—in fact, the lowest of the costs examined by the Committee were more than 50 p.ct. in excess of the price at which the German mantles are sold. This being so, it is manifest that the British makers are powerless to compete on equal terms with German mantles. Moreover, the German makers do not appear highly scrupulous regarding the price at which they sell. The German Convention fixes minimum prices for the export of ordinary types of standard mantles free to door in England; and the price to wholesalers on April 22 last was 34s. 6d. per gross, or a fraction under 3d. each; and the Committee are satisfied that the bulk of the imports have come into this country at the Convention rates. Compared with those prices, in the revised lists issued by the British makers last March, the wholesale prices were 47s. and 54s. per gross; and the makers are now offering a special rebate of 3s. on advertised brands, and 2s. on non-advertised brands, to dealers who handle British made mantles only. Despite the disparity in selling prices, the Committee, while inclined to think the industry is over-capitalized, feel that, if they take into account the special circumstances in which it was developed during the war, they are justified in finding that it is conducted with reasonable efficiency and economy.

We have said the German makers do not appear to be over-scrupulous as to the prices at which they compete. It is not supposed that they wish to lose money in their transactions; and, in fact, they do not. But there are such things as ulterior motives in the lines that some business operations take—for instance, in keeping well below the productive costs of the article in the country concerned. We have heard of the "strangle-hold;" and the word is called to mind by one passage in the report of the Committee. It is this: "The kernel of the whole German "export position lies in the answer given by the chief Ger- "man witness to a question whether their export prices "bear any relation to the home production costs or home "profits. His reply was: 'We practically consider only the "price of the country to which we send. It is the principal "'point.'" The German witness deserves our acknowledgment for his candour. It enables us to draw highly interesting conclusions. The fact too is plain that the competition has caused a considerable shrinkage in business and employment in the home industry, and that is not the way to a maximum lowering of prices. We agree that the gas-supply industry in these days cannot afford to be philanthropic; but a little mixing of patriotism with our dealings would do no harm, but a substantial amount of good. The last thing the gas industry should desire is to see the British makers throttled out of existence, and the mantle market left largely to the mercy of the German manufacturers. When the war started, we were soon in a precarious position in respect to the supply of mantles. We mention this lest some forget.

Since the issue of the report, the Board of Trade have made an Order, which comes into force forthwith, applying Part II. of the Act to gas-mantles, or component parts thereof, whether finished or not, manufactured in Germany. The Order imposes a duty of 33⅓ p.ct. *ad valorem*. It will be noticed that the duty only applies to mantles manufactured in Germany, and not in any other country. A certificate of origin will be required in the case of mantles or parts from all foreign countries in Europe. If these certificates of origin all tell the truth, there will be no trouble; but is there no possible chance of evasion? We wonder, for instance, if the imports from Holland will increase. It will be interesting to watch this. Whether the 33⅓ p.ct. will directly benefit British makers remains to be seen. It will depend upon whether the German makers, in pursuing their policy, will think it worth while to come down to a price that, *plus* the duty, will still undercut the British makers.

Training for the Gas Profession.

FROM junior to senior status Mr. George Dixon passed some three years ago when he went to Lancaster. The one state and the other may be said to be still proximate; but the three years' full responsibility has put Mr. Dixon into possession of experience which enables him to examine the affairs and interests of the junior members of the gas profession with a vision much enlarged beyond that of former days. Therefore, the address with which he inaugurated his year of office as President of the Manchester and District Junior Gas Association will be read with much interest by all who are looking to occupy a higher place in the gas profession; and we may suggest that a perusal of the deliverance by those engineers who take in hand the training of young men for the industry will probably prove helpful. We are quite certain that the training of men for the gas profession has not, as we stand to-day, been given that definite shape that is desirable not only for the aspirants themselves, but for the industry generally. This, of course, is speaking broadly, and without reflection upon those engineers who take a real interest and pride in their pupils, and do not leave them to pick up, as best they may, knowledge of gas engineering and management on the works and in the district. The address was a continuous chain of sound advice; and the advice may be construed into criticism of the lack of method on the part of both juniors undergoing training and seniors with juniors under them. There is duty on both sides; and Mr. Dixon examines the position and makes suggestion, which should lead to introspection and new practices in this important regard.

There has been large, if gradual, progress made in the technical and commercial work of the industry. Recently there has come a revolutionary change; and the boundaries of the gas man's activities have been pushed outwardly to a tremendous extent. This means much greater responsibility, which in turn requires increased knowledge and qualifications. Therefore, if the industry is going to make the most of its opportunities and progress at a rate which is well within its power, subject to economic facilities, it must raise the standards of scientific, technical, and commercial knowledge and qualification for its chief executive officials. Mr. Dixon urges this; and in this connection, he expresses the hope that the education scheme under consideration between the Institution of Gas Engineers and the Board of Education will be hastened forward, and be eagerly supported by all concerned. The scheme is well advanced; and after its final discussion, and amendment if need be, it is probable there will be early application. But hitherto sufficient has confessedly not been done in the matter of individual promotion of a system of training which coincides with development and extended requirement. And yet to-day there is no greater need in the industry than the preparation of men on the right lines for shouldering work which has been raised to much higher levels; while—with exceptions of course—indurated custom continues paramount in the training of men. The blame is on both sides; but we should rather allocate the larger part to those engineers who are indolent and indifferent as to how their pupils fare in the gaining of the knowledge necessary to make of them fit professional men for current and prospective times. It is quite true that it is "the duty of every junior to look "after himself;" but it is also the duty of the seniors to look after the work of the juniors who are placed under them. Definite duty should be planned for the pupils; and there should be, in turn, concentration upon every part of the plant and every process from A to Z. In the industry we want men who are strong in attainment; and such men—unless they are exceptional ones—cannot be obtained by training

procedure that is innocent of all system. Particularly should pupils give close attention to the study of efficiencies —their improvement and maintenance. It is wonderful what an amount of useful knowledge of plant and processes can be obtained by making efficiencies the basis of study; and the while, the student will be increasing his own value to the works upon which he is engaged.

There is no need to go here in detail into Mr. Dixon's address. With most of his points we thoroughly agree. The only one upon which we hold a different opinion, as far as lines of training are concerned, is where he expresses the view that juniors entering the profession should serve their practical workshop period first, to be followed by an approved course of technical training. We will not say categorically that Mr. Dixon is not right. But our experience persuades us that knowledge of theoretical principles should come before practice, so that, during the period of workshop training, the pupil may know the why and the wherefore of what he is doing, or is told to do. A man loses much during his practical training if he is not the possessor of the fundamentals which enable him the better to understand the practice. The inevitable question of remuneration was referred to in the address. This is a difficulty; but the industry has seriously to take into account the fact that talented men will not be attracted by indifferent recompense. In the place of first importance in the equipment of a gas-works, we set the man who is entrusted with the top position and responsibility.

Among miscellaneous matters, Mr. Dixon dealt with the work of the junior organizations. He does not particularly favour the word "junior" in the titles of these organizations. Some men who are in responsible positions in gas-works as assistants are not qualified for membership of the senior district associations; and therefore their only available place is in the junior organizations. Applied to many of them the term "junior" is a misnomer. We sympathize with Mr. Dixon's desire to see a change. Something more descriptive and fittingly embracing would certainly be an advantage. How would (for example) "——— ——— Gas-Works Assistants' "Association" suit? As to the meetings, we would strongly commend to consideration the President's suggestion that short notes, instead of long papers, should be submitted, and less be crowded into each meeting. The journalists of the gas industry would welcome the change; for we may say very frankly that the plethora of material that comes before us now is frequently very embarrassing, and, much against inclination, space and expense insist on the exercise of our powers of curtailment—with more or less good effect, but not always to the satisfaction of the authors.

Consumers and the Therm Basis.

"The Times" on Saturday last published a letter from Sir George Beilby, Director of Fuel Research, on the subject of the origin of the therm basis of charging for gas. In this he shows how much, in the conception and inception of this basis, the interests of the consumers were considered, and, in fact, to what a large extent representatives of the public took part in the preliminaries that led up to the change. As Sir George points out, even before the war great dissatisfaction was being expressed by representatives of the London County Council and other large consumers at the steadily increasing quantity of incombustible constituents in gas. This was accentuated during the war through uncontrollable circumstances. There came the reference by the Board of Trade to the Fuel Research Board. That the Board did not deal with that reference in any perfunctory manner, we of the gas industry well know. They spent quite a year and a half in its study from all aspects. In doing this, a point that requires to be emphasized—and is in Sir George's letter—is that the Board called to their aid experienced representatives of consumers and producers, whose views were of great value in enabling them to reach their conclusions and recommendations. The conferences with these representatives were long and many; and it was due to them, combined with the Board's considerable research, that the proposal came that gas should henceforth be bought and sold on a thermal basis, with (this is generally overlooked) a continuous control, and not an intermittent one as heretofore, of the calorific value of the gas supplied. Sir George remarks upon the importance from the consumer's point of view of this continuous automatic control, as well as upon the stipulation of the Gas Regulation Act, which largely issued from the investigation and recommendations, as to the readjustment of the burners of consumers whenever the calorific value of the gas was changed. Sir George's letter shows how well the interests of the consumers were studied from the very start of this matter, and how it all originated in a matter over which there had been serious complaint. Consumers do not pay for incombustibles under the therm system; and there is good reason why, under that system, gas undertakings should do their utmost to keep them down to the minimum. They had not the same reason before; and gas consumers had not the same protection as they have now. Moreover, wherever the therm system is applied, consumers can now compare charges per therm (which is definite), whereas before they could only compare charges per 1000 c.ft. of gas—differing in thermal value.

The London Tenpence.

We do not call to mind any past period in which the three big London Companies have supplied gas at equal prices. The last reduction of 1d. by the Gas Light and Coke Company has brought the price to 10d. per therm; and this is the figure at which gas is being sold by the South Metropolitan and the Commercial Companies. The South Metropolitan, however, have indicated an early further recession in price. At the present time, in the matter of lowness of price, Wandsworth and Hornsey are leading in London and the suburbs.

Gas Consumption—Then and Now.

In his Presidential Address to the North of England Gas Managers' Association, Mr. J. E. Blundell, of Carlisle, supplied a statement which showed the progress of gas consumption since the gas undertaking passed into the hands of the Corporation. In 1850, the number of consumers was 1008, and the annual consumption 40,000,000 c.ft. In 1921, the number of consumers was 12,496, and the consumption for the year 432,215,000 c.ft. In 1850, therefore, the average consumption per consumer was 40,000 c.ft.; and now it is about 34,600 c.ft.—a drop of 5400 c.ft. But in 1850 gas was, generally speaking, used only for flat-flame lighting; in 1921, it was employed for all sorts of purposes—lighting, heating, cooking, and power. From a lower average consumption to-day, consumers are obtaining a variety of service—lighting, heating, cooking—and much more light than they ever had from gas in 1850. The fact demonstrates a wonderful progress in gas utilization, and a remarkable economy for consumers. If consumers were thrown back from present conditions to those of our grandfathers or fathers, they would have something over which to make contribution to the columns of the "Daily Mail."

Loans for Gas-Works.

Satisfactory periods for repayments of loans for gas-works purposes are being secured from the Ministry of Health, though in some respects—for example, for buildings and foundations—a period of forty years could reasonably be granted, instead of thirty years. The Carlisle Corporation obtained sanction to borrow £350,000 for their new gas-works; the periods of repayment being fixed as follows: Buildings and foundations, retort-bench ironwork, washers, condensers, governors, and piping, 30 years; reinforced concrete water-tower, hoppers, tanks, &c., exhausters, and purifiers, 20 years; retort-bench brickwork, machinery and boilers, and furniture, 15 years; station meter, 10 years.

Enrichment by Low-Temperature Gas.

In the "JOURNAL" this week, Mr. Walter Chaney returns to the subject of the enrichment of town gas by high-grade gas produced by the low-temperature system of carbonization. He takes different grades of gas, and varied percentages, enriching up to a declared calorific value by low-temperature gas. He has worked-out the costs; and the savings per therm are shown. Multiplying those savings by the therms produced per ton of coal, a very healthy economy is demonstrated by the calculations.

Sulphate of Ammonia Prices.

The British Sulphate of Ammonia Federation have fixed the price at which they are prepared to sell sulphate of ammonia for November and December delivery. It is £16 13s. for neutral quality, on the 25¾ p.ct. ammonia basis. In the notice in our news columns, the worth of sulphate of ammonia in comparison with nitrate of soda prices is shown.

Wales and Monmouthshire Juniors.

Hearty welcome is given to the Wales and Monmouthshire Junior Gas Association, which has recently held (as reported in other columns) its first meeting. The parent of this organization is the Wales and Monmouthshire Institution of Gas Engineers and Managers; and this fact is one great encouragement for the future of the young organization, as it can always depend upon the counsel and assistance, when required, of the parent body. The first President of the Junior Association is Mr. T. B. Armitage, of Swansea, and the Secretary is Mr. J. B. Bell, of Cardiff. The organization starts well; and we shall be much mistaken if the Association does not quickly establish itself on lines of equality with the older junior organizations.

Fuel Prices.

The prices per therm for gas are descending; the prices per ton for household coal in London have been increased by from 2s. to 3s. according to class. The gas-fire business should feel the effect of the high retail prices for coal, and so should local sales of gas coke.

Gas Coal Position.

There is little in the past week's gas coal market intelligence that calls for special notice. Quotations were on the same lines as the previous week for Durham and Northumberland brands, though the strength of demand was excellent. More of the gas undertakings patronizing Lancashire and Cheshire have entered into contracts; and perhaps they have been wise in having taken this belated course, in view of the winter months ahead. From most of the other markets the information comes that gas undertakings are increasing their demands for stocking purposes, though in industrial areas there has been a falling-off of the consumption of gas for manufacturing purposes. Yorkshire and Nottinghamshire report that there are good stocks of gas coal available at the collieries.

Miners' Wages.

The coal owners have rejected the appeal of the Miners' Federation for an increase in the minimum rate of wages. The situation that has been created is not a pleasant one, in view of the declaration of the National Coal Board that the economic position of the coal industry, as well as that of other industries, makes it impossible to concede any addition to the miners' minimum. The Miners' Federation are seeking an interview with the Prime Minister, to see whether there is a chance of extracting a subsidy from the Government. The Miners' Federation are great on subsidies. The Prime Minister no doubt is profoundly glad that the other great trade unions do not go to him appealing for similar assistance. Of course, the Federation avoid a very obvious way in which earnings might be increased. It could be done by a reduction of the working costs; seeing that, under the terms of the agreement entered into at the end of the coal stoppage, the men stand to gain as much by a reduction of the costs of working, as by an increase of wages. They should try the effect of a return from a seven-hour to an eight-hour day. Of every 1s. per ton saved, the men would receive 83 p.ct.; and one authority estimates that the cost of production has been increased by 2s. to 2s. 6d. per ton through the seven-hour day. Mr. Frank Hodges, the Secretary of the Miners' Federation, thinks the way to compass the desired end is by raising the price of coal 3s. per ton. He should think of how the miners can assist as well as the consumers; the latter are now paying far more per ton than in pre-war times.

PERSONAL.

Mr. P. C. CLEASBY, Manager of the Guildford Gas Light and Coke Company, has resigned his position; and in the "JOURNAL" to-day there appears an advertisement inviting applications for the post.

Mr. B. W. SMITH, Gas Engineer and Manager to the Walsall Corporation, has resigned his position. The resignation is to take effect on March 31 next. The Gas Committee recommended that, in consideration of his services, he be granted a retiring allowance of £250 per annum. To this recommendation the Town Council agreed at their meeting on Monday.

Alderman GEORGE CLARK, J.P., Managing-Director of the Bryan Donkin Company, was, at a meeting of the Chesterfield Town Council last week, elected the new Mayor of the Borough. Alderman Clark is a member of the Institution of Mechanical Engineers, of the National Gas Council, and of the British Commercial Gas Association; and last year he was Chairman of the Society of British Gas Industries. Sixteen years ago Alderman Clark went from the Bermondsey works of the Bryan Donkin Company to be Works Manager at Chesterfield, and later he became Managing-Director. The concern has made great headway under his control. He is Chairman of the Chesterfield Gas Committee, and was elected to the Town Council in 1910.

The employees of the Barrow-in-Furness Corporation Gas and Water Department met last Thursday evening to bid farewell to Mr. FRED CHADDERTON, on his retirement from the position of Engineer and Manager of the department. The proceedings took the form of a smoking concert and presentation, and were presided over by Mr. C. Diamond, Assistant Engineer and Manager. The presentation, which consisted of a wallet of Treasury notes, was handed to Mr. Chadderton by Mr. Wickham, Foreman of the Stove and Meter Department, who expressed, on behalf of the whole of the employees, their sincere appreciation of Mr. Chadderton as a Chief, and their great regret at losing him. Other speakers, including Mr. Bethwaite, Secretary of the men's Union, supported, and wished Mr. and Mrs. Chadderton all prosperity in the future. From the manner in which the various remarks were received by the company, it was evident that Mr. Chadderton was a highly popular Chief, and one who had won the goodwill and esteem of the whole of his men. Mr. Chadderton feelingly thanked the subscribers for their gift, and for the kindly thoughts which had prompted it.

OBITUARY.

In the Chesterfield Town Council last week, Alderman George Clark (the Chairman of the Gas Committee) made sympathetic reference to the death of Mr. W. T. BUCKLAND, formerly Gas Engineer to the Corporation. He said Mr. Buckland was for 44 years in the service of the Gas Company, the Gas and Water Board, and the Corporation.

INSTITUTION GAS RESEARCH FELLOWSHIP.

Dr. A. C. Monkhouse has resigned the Institution Gas Research Fellowship, which he held for two years at the University of Leeds, and has been appointed Research Assistant in the service of the Joint Research Committee of the Institution of Gas Engineers and the University of Leeds. Dr. Monkhouse takes the place of Mr. F. S. Townsend, who, as previously announced in these columns, has joined the Technical Staff of Sir Arthur Duckham.

Mr. Stuart Pexton, M.Sc., has been appointed to the Institution Gas Research Fellowship. He took his B.Sc. degree in 1920, with Chemistry as principal subject, after returning from active service. (His preliminary training was received in the Secondary School and the Technical College of Huddersfield.) After two years' further training in the Department of Coal Gas and Fuel Industries, Mr. Pexton took a first-class honours degree in Gas Engineering and the M.Sc. degree, submitting a thesis on the research work which he had carried out in the laboratories of the department.

"The Gas Salesman."—Binders for filing "The Gas Salesman" are now on sale at the "JOURNAL" office. They are spring backed, with cloth sides, and gilt lettered. The price is 3s. 9d., carriage free.

Economy in Fuel.—Mr. H. Astbury, the new President of the Birmingham Association of Mechanical Engineers, spoke on "Economy in Fuel" at the inaugural meeting of the session. The more efficient use of coal could, he said, be secured by more careful sorting and preparation at the mine—by sorting the combustibles into fuels of greater convenience, as at gas-works; and by improvements in boiler firing. The best examples of this were the large "super" power stations. The much-debated therm imposed by the Gas Regulation Act of 1920 had given gas engineers a serious problem to face in maintaining the value during sudden demands, as when a fog occurred; and important and successful experiments to this end had been carried out at the Birmingham Gas-Works.

Scottish Junior Gas Association (Western District).—The opening meeting of the session will be held in the Royal Technical College, Glasgow, next Saturday evening, when Mr. W. J. Lennox, of Falkirk, will deliver his Presidential Address. The meeting is to be preceded in the afternoon by a visit to the Housing and Health Exhibition, Kelvin Hall, Glasgow. On Saturday, the 28th inst., members are visiting the Carron Works at Falkirk.

Yorkshire Junior Gas Association.—The twentieth annual general meeting of the Association (which will be combined with a tea and smoking concert) is to take place on Saturday, Oct. 21, in the Lecture Room of the Fuel Department of Leeds University. After the business meeting, at which the new officers will be elected, Mr. C. S. Shapley, Engineer and General Manager of the Leeds Corporation Gas Department, has promised to deliver a short address. During the proceedings, a presentation is to be made to Mr. F. Peel, of Tyldesley, lately the Hon. Secretary of the Association.

ELECTRICITY SUPPLY MEMORANDA.

Who among those interested in electrical developments does not know of the tremendous splash that was made over the "enterprise" of the Hereford City Council and their Electricity Department in developing supply in rural areas?

The Truly Rural Fiasco.

Special articles appeared, the electrical papers advised all and sundry among electricity suppliers to go and do likewise. The Hereford Committee were applauded; their's was a magnificent example. The picture has changed; all that was represented as so bright is now woefully overcast. There has been an inquiry by a Special Committee into the financial position of the Electricity Department. A report in the "Bath Chronicle" states that in three years upwards of £100,000 have been spent, and that of this sum £10,000 cannot be accounted for. Surely this is a mistake! It is also stated that one firm was paid £900 commission on poles supplied by another firm. Can this be really true? However, quite a new tone is being adopted by the electrical papers. The once applauded Electricity Committee are now being upbraided for not having exercised sufficient control over the financial and business side of the undertaking. The "Electrician" tells us that subsequent events have shown that it was unwise to expand the rural transmission lines so rapidly at a time when the prices of materials were very high. It is all very well to say this now; but why was it not said at the time the expenditure was being made? It further informs its readers that it appears from the investigations that the accounts have been kept so loosely that it is impossible to allocate the outlay on the various items of expenditure. So our contemporary does some moralizing that would have been more appropriate nearly two years ago. "The moral of the inquiry," it says, "seems to be the necessity for vigilance on the part of a Committee who is spending public money on what is practically a speculative, though useful, public enterprise, and for close attention being paid to the financial details." We quite agree. Every municipal electricity committee should ponder over those words. Now our contemporary thinks that what has proved such an expensive matter for Hereford is a class of work that should be carried out by a joint electricity authority or by a power company. Of course, it is easy to be wise after the event; and it is very simple then to tell people what they should have done. Ordinary intelligence suggests that heavy capital expenditure to secure lean custom is not profitable. The lesson of Hereford should have good influence not only on municipalities, but on joint electricity authorities and power companies. It is all much the same as electricity undertakings dropping down into the lower social regions to secure an attenuated lighting custom, which does not return a sufficient profit to pay for the capital outlay in making the provision for supply and use.

Electricity Commissioners' Report.

The report of the Electricity Commissioners for the year ended on March 31 has been issued. The Commissioners have the satisfaction of knowing that, while they are not looked upon as judicial paragons in some quarters of the electricity supply industry there are other people in it who can see nothing wrong in what they do. But those who think both ways have to help to pay the bill for the upkeep of the new Department. The approved estimated net expenditure of the Commissioners for the year was £44,000. This is being defrayed by the Exchequer making a total advance, including interest, of £90,796, which has to be repaid by annual instalments by March 31, 1925. But it is learned that, as from April 1, the Commissioners' expenses are to be provided directly by the industry. The report shows that a considerable amount of work has been done by them. The Minister of Transport confirmed 31 Special Orders during the year, and a further five awaited confirmation on March 31. Under the Statutory Undertakings (Temporary Increase of Charges) Act, 19 Orders were made. Increases in maximum prices have been allowed in 24 cases. Revocation of Electricity Supply Orders has been effected in twelve cases, and parts of two Acts relating to electricity supply have been cancelled. Consideration is being given to the revocation of a further eight Acts; and the granting of certain Orders has been deferred. No less than 46 authorities have secured permission to erect overhead lines for the supply of current. Consent has been given to the erection of eleven new stations, representing a total initial installation of 30,660 kw. Authorized extensions of 50 existing stations represent approximately 143,700 kw. of generating plant. In addition to the applications not disposed of at the date of the last report, the Commissioners received 394 applications from local authorities for permission to borrow funds for electricity purposes. Sanctions were issued in respect of 389 applications; the total amount authorized being £13,708,385. At the commencement of the period covered by the report, the Commissioners had before them 27 applications for Special Orders under section 26 of the Electricity Supply Act, 1919; and during the period covered by the report, they had a further 43. In respect of these applications, the Commissioners issued 38 Orders. In seven instances, approval was given to agreements between undertakers for mutual assistance or bulk supplies. No fewer than 58 Orders were made permitting undertakers to supply electricity to specific premises situated outside their areas. Special systems of supply were sanctioned in respect of 28 undertakings. These are only some of the lines of activity of the Commissioners; but the chief of all their functions has been the work in connection with delimiting electricity supply areas under the 1919 Act, and the consideration of schemes for Joint Electricity Authorities or advisory bodies. The latter appear to be getting to work with more immediate effect than the former. However, this brief reference to the labours of the Commissioners shows that they cannot have many idle hours.

Reorganization Schemes.

The position of the reorganization projects is as follows: First as to the Lower Severn District, the scheme submitted by the Organizing Committee is not being proceeded with. Draft Orders embodying the decisions of the Commissioners are now in course of preparation for the Mersey and West Lancashire District, North Wales and Chester District, London and Home Counties District, South-West Midlands District, and South-East Lancashire District. In the case of the West Riding (Aire and Calder) District, negotiations are in progress between the principal parties on certain matters arising from the decision. The Commissioners have not yet issued a statement of their conclusions and decisions in the cases of the North Lancashire and South Cumberland District and the North-West Midlands District. Local inquiries have not yet been held in respect of the East Midlands District, North-East Midlands District, and Mid-Lancashire District. In the cases of South Wales, the West of Scotland, and the East of Scotland, schemes had not been submitted at the date of the report.

Assistance of the Gas Agitation.

We occasionally see some very intemperate and some very silly things printed in the electrical papers. The first paragraph this week points to one matter over which some electrical people went half mad with delight—the spending of large sums of money to obtain business where little business resided. There are the many schemes for the supply of electricity to small houses that have brought little but disappointment and additional burdens. And then there are the dreams of a flood of business in domestic electric heating, cooking, and hot-water supply, despite the low thermal value per unit of electricity. The "Electrical Times" has been making inquiries among electrical manufacturers as to the trade outlook. In this respect the reports are generally hopeful. It is said that the prices of electrical appliances to-day encourage demand. The prices do not strike us as being very tempting. The tariffs for lighting, power, and heat are being reduced; and increased enterprise is being shown in tempting consumers on to the mains. A fair amount of building work is in hand; and (so it is said, without reference to what is being done by gas) "wiring goes almost automatically into the new middle-class property if supply mains are within reach." But here is a gem of a paragraph drawn from the great depths of the imagination of the "Electrical Times." "The prospects for electric heating and cooking were never so bright. Gas has become thoroughly unpopular owing to the mistrust aroused in the public mind by the bill-swelling propensities of the therm. The competition between gas and electricity for heating and cooking has entered upon a new phase. The newcomer has established a solid footing; and it is now generally recognized that convenience and efficiency have a money value that renders futile a mere comparison of the respective gas and electricity bills. Just as electric light was nominally several times dearer than gas light ten years ago, yet gradually swept the field because of its real economy, so electric heating and cooking are justifying their economic superiority and paving the way for another triumph." From an intimate knowledge of these matters, it is easy enough to place a proper value upon the "economic superiority." Such fatuous writing as is found in that paragraph can be left without comment.

Heating and Therm Costs.

The "Electrician" has published its annual "trade promotion number," which bulks largely with advertisements and contains some special articles. One of them is by Mr. L. L. Robinson on the "Development of the 'Other Uses' Business." The "Other Uses" appear to be domestic heating and cooking, which, according to the author, have been sadly neglected. Neglected by whom? So far as we can ascertain, the neglect has been by householders, who, generally speaking, are not enamoured of electric heating and cooking appliances, and for well-known reasons. Mr. Robinson admits that, except in very rich districts, the "other uses" consumers cannot be obtained upon a large scale without a low price per unit, which many managers appear to regard as unremunerative. But the author is inclined to controvert this. He asks, Are low prices, such as 1d. per unit, unremunerative to undertakings where the fuel cost is only about ½d. per unit? He leaves the question to the reply of every reader who is concerned in it. In his opinion, with proper hiring organization, electric heating and cooking will prove itself much more acceptable to the woman in the home than gas heating and cooking. Is it only hiring organization that is required? We think not. If the remainder of Mr. Robinson's article can have full credit put upon it, then the wonderful things that electricity is asserted to be capable of effecting in heating and cooking should have carried it much farther along the road to adoption; but consumers know that

electrical assertion and working experiences do not always coincide. As Mr. Robinson frankly points out, at 1d. per unit a therm costs electricity consumers 29d.; and he compares this with 11d. per therm for gas. He submits that an electric radiator will give to a room 75 p.ct. of radiant heat, whereas a gas-fire gives 50 p.ct. But he planks another 25 p.ct. on to the electric heater for convected heat, and ignores the fact that the gas-fire also imparts convected heat to the air of the room. Perhaps Mr. Robinson does not know that time and again tests have been made of the products of combustion of modern gas-fires, and the results have shown that the heat carried off is about 20 to 25 p.ct. of the heat of combustion; and this heat has a big effect in promoting ventilation. Therefore the gas-fire can take credit for at least 25 p.ct. of the heat in convected form, thus making an over-all efficiency of 75 p.ct. Let us therefore concede to Mr. Robinson an efficiency for the electric heater of 100 p.ct., and claim 75 p.ct. for the gas-fire (which can readily be demonstrated), then we shall require to use with the gas-fire 1⅓ therms to throw into the room an amount of heat equal to the electric-radiator. This 1⅓ therms would, at 11d., cost 14·7d., or about half the 29d. for electricity. And electrical men should not forget that prices per therm are descending throughout the gas industry. There are some undertakings now selling at 6d. per therm, which makes the comparison very bad for electricity at 1d. per unit.

Efficiencies and a Hidden Virtue.

Mr. Robinson says 1d. per unit in the poorer districts of London and 1½d. per unit in the richer districts are more than competitive for cooking—they are decisive, because the thermal efficiency of electric cooking is enormous compared with the thermal efficiency of gas cooking. Now what services are comprised by Mr. Robinson in the term "cooking?" The authorities tell us that a fair division of the cooking load is 80 p.ct. for the hotplate and 20 p.ct. for the oven; and in the houses of the middle class and poorer people, the hotplate of the gas oven is used extensively for the heating of water for many purposes other than those that have anything to do with the preparation of meals. When the over-all average efficiency of the gas-oven and hotplate is put alongside that of the electric-oven and hotplate, we guarantee that the former will have nothing to be ashamed of—rather the contrary; and what is more, with the gas-oven there are no heating elements constantly undergoing deterioration. But there comes something else—something that the electricians clutch like a drowning man at a floating straw. Mr. Robinson says that "the improvement of food taste and reduction of waste impress themselves upon every user at once." There we have a suggestion that electric heat is different from all other heat. What is the nature of that hidden virtue of electric heat that should make food cooked by it taste better than that cooked by any other form of heat? Then as to the reduction of waste. People have very different ideas as to how meat should be cooked. Some like it well-done; others, moderately so; and some, under-done. They know that time and temperature are the factors that go to produce the cooking of meat as they desire it. If temperatures are equal, why is it that there should be more waste by gas than by electric heating? Perhaps Mr. Robinson will answer this question. He advises that the cooking and heating business should be promoted by offering the appliances at reasonably low rates. Another plan he suggests is to provide appliances free of initial cost, but to charge by prepayment meter, adding 2d. per unit for lighting and ½d. per unit for cooking to pay for the charges on the appliances. Really, if all Mr. Robinson says is true about the virtues of electric apparatus, householders ought to become, and would become, possessed of them at almost any price. But they do not; and this hard fact is one that has to be dealt with.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Inaugural Meeting.

Though a few months only have elapsed since it was proposed that the junior officials in Welsh gas undertakings should be organized, the suggestion met with such ready support in every direction that a strong Junior Association has already commenced its activities. It has been reported in our pages that following a meeting called by the Wales and Monmouthshire Institution of Gas Engineers and Managers, a Committee was formed to complete the work then started. Since that time, much has had to be done to crystallize the proposals into a complete scheme which would secure membership. This has been successfully carried out, with the result that it was possible to hold the inaugural meeting on Saturday, Sept. 30, at Cardiff.

Visit to the Cardiff Incandescent Mantle Company.

The programme included a visit to the factory of the Cardiff Incandescent Mantle Company. The visitors were received by Mr. Roberts, who, in welcoming them, explained that, with the assistance of Mr. Rite and Mr. Goldsworthy, he had arranged that the whole process of mantle making should be shown and explained. In this way it would be possible for everyone to obtain an insight into the methods of manufacturing a commodity which was important to the industry. The party then proceeded to the impregnating, washing, and drying rooms, where they saw the ingredients, solutions, stockings, &c.; and the composition of the solution and the reason of the proportion of ingredients were explained. Afterwards the machines for knitting the ramie thread and cutting the stocking into lengths were inspected. The processes of tying-on, burning-off, and hardening proved interesting; and when the production of a batch of collodionized mantles completed the various operations, it was generally felt that those present had had an opportunity of improving their knowledge of the process.

Mr. B. J. Bell (Cardiff), in proposing a vote of thanks, said that Mr. Roberts was to be congratulated on the arrangements which had been made for the instruction of the members, and they had thoroughly enjoyed the visit. The appreciation they felt was enhanced when they remembered that Mr. Roberts and his colleagues had run the works at an inconvenient time in order to meet the wishes of the Association; but he would know by the interest shown that his efforts had not been in vain.

Mr. T. B. Armitage (Swansea), in seconding, assured those who had worked for the benefit of the gathering that the visitors would leave with a better knowledge of the business than they had before.

Mr. Roberts, replying on behalf of himself and those who had assisted him, expressed his satisfaction at the interest which had been evinced. If the visit had been beneficial, he was sure that the Cardiff Incandescent Mantle Company were gratified.

Indebtedness to the Cardiff Gas Company.

The party then proceeded to the offices of the Cardiff Gas Light and Coke Company, Bute Terrace, where they were entertained at tea by the Directors. Mr. F. Boardman (the Deputy Engineer) welcomed the members.

Mr. Armitage, in proposing a vote of thanks, remarked that the members were indebted to the Directors and to Mr. George Clarry, the General Manager of the Cardiff Gas Company, for the assistance they had so readily rendered on the occasions of junior meetings. The General Manager had shown the keenest sympathy with the movement. In the vote he included the Engineer (Mr. H. D. Madden) and Mr. F. Boardman, who had so ably carried out the duties of host.

Mr. A. H. Shepherd (Swansea) seconded the proposal, and remarked that on every occasion it was a noticeable fact that Cardiff could always be looked upon to do the best for any meeting of gas men that might be held in the city. But to-day they had improved, if possible, upon previous efforts, and the arrangements had been very thorough.

Mr. Boardman, replying, stated that the Board of Directors always opened their doors to promote the welfare of the gas industry.

Office Bearers.

Afterwards the meeting proceeded with the business for which it was summoned, and the rules drafted by the Provisional Council were amended and adopted. Nominations had already been arranged for the various offices; and the election was by ballot. The following officers were appointed:

President.—Mr. T. B. Armitage (Swansea).

Vice Presidents.—Mr. T. A. Canning (Newport) and Mr. V. Dodgson (Pontypridd).

Treasurer.—Mr. R. J. Auckland (Cardiff).

Secretary.—Mr. B. J. Bell (Cardiff).

Council.—Messrs. A. H. Shepherd (Swansea), three years; J. Wood (Pentre), three years; D. M. John (Aberdare), two years; G. Hughes (Chepstow), two years; W. E. Crowley (Newport), one year; and H. Lewis (Abertillery), one year.

Auditors.—Messrs. T. Noall and J. B. James.

Mr. J. B. James (Cardiff) proposed that, this being the first meeting of the Association, the members tender their best thanks to the President, Council, and members of the Wales and Monmouthshire Institution of Gas Engineers and Managers for the support they had given to the formation of the new organization—mentioning particularly the work of Mr. Octavius Thomas in the preliminary stages.

Mr. J. Wood (Pentre) seconded the motion, which was carried with acclamation.

The Secretary explained the functions of the Joint Council of Junior Associations; and it was decided to approach that body with a view to affiliation.

This concluded the business, which had been conducted in a most enthusiastic manner. The new venture has every promise of a successful future, and an extensive membership, which will enable the Association to take its place with others that have been in existence for many years.

Scottish Junior Gas Association (Eastern District).—The opening meeting of the Association for the present session was held in Edinburgh last Saturday, when the President (Mr. W. A. Dearden, of Dunfermline) delivered his Inaugural Address. Our account of the proceedings is unavoidably held over for the next issue of the "Journal." An attractive syllabus for the session, including several joint meetings with the Western District Section, has been arranged by Mr. R. L. Laing (the Hon. Secretary and Treasurer).

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

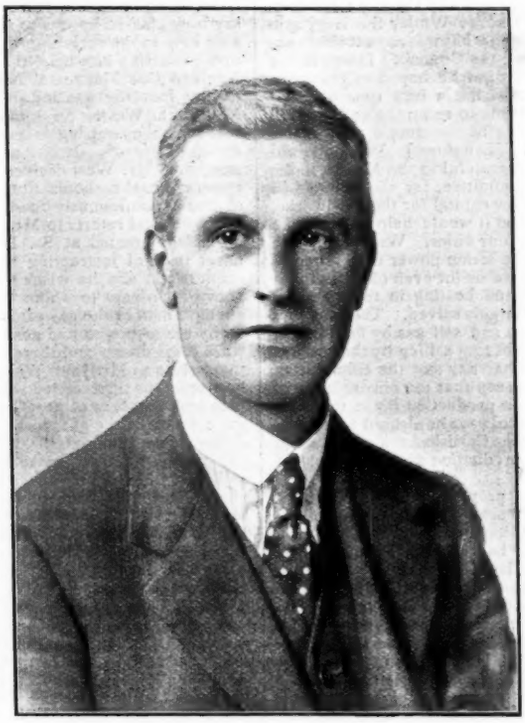
INAUGURATION OF THE CITY OF CARLISLE'S ROME STREET GAS-WORKS.

THE formal inauguration of the Rome Street Gas-Works of the City of Carlisle took place last Friday, in the presence of a large gathering of civic dignitaries and of representatives of gas undertakings not only in the North, but throughout Great Britain. On the same day the members of the North of England Gas Managers' Association held their Autumn Meeting at Carlisle, and heard the Presidential Address of Mr. J. E. Blundell, who is the Engineer and Manager of the Carlisle gas undertaking, and who devoted the major portion of his address to a description of the new works, the erection of which he has supervised.

THE "OPENING" CEREMONY.

The day's events commenced outside the exhauster-house, where an inscription stone has been fixed giving the date of the opening and the names of the chief figures in the ceremony. The Mayor of Carlisle (Councillor Archibald Creighton), wearing his chain of office, stood on the steps, and with him were Alderman J. P. Buck, Chairman of the Gas Committee, Mr. Blundell, the Mayoress, and Alderman Fred West, of Manchester, representing West's Gas Improvement Company, Ltd. Others who were present included the members of the Carlisle City Council. There were also present Mr. J. D. Smith (Belfast), President of the Institution of Gas Engineers; Mr. Samuel Tagg (Preston), Senior Vice President; Mr. Thomas Hardie, immediate Past-President, and Chief Engineer of the Gas Light and Coke Company; Mr. J. Smith (Stirling), President of the North British Association; and many other visitors, including generally the members of the North of England Gas Managers' Association.

The MAYOR welcomed the visitors to the city on that auspicious occasion in the history of Carlisle's municipal enterprise. They were inaugurating what he believed to be the most up-to-date gas plant in the country. The question of the erection of a new gas plant in the city had been the subject of much discussion, and successive managers had reported on the unsuitability of the old plant, which was hopelessly out-of-date and costly to manipulate. The Gas Committee had given much time and thought to the matter. Finally (in 1918) the problem had to be faced, and a decision made—whether to spend huge sums on the existing plant or erect new works of the most up-to-date kind. One other factor had to be faced. Was it possible that in a few years electricity might displace gas, and if they expended large sums on the erection of gas plant, might they not ultimately entail the city in a heavy financial loss? He expected the members of the North of England Gas Managers' Association would be able to supply an answer to that question. [Laughter.] The Gas Committee (wisely, in his opinion) seeing that the old gas-works were clear of debt charges, and that great progress had been made in manufacture during recent years—science having completely revolutionized the process—decided to make a fresh start, and that day was the inauguration of the new supply for the city. It gave him particular pleasure to welcome the members of the North of England Gas Managers' Association, the more so as they had for the current year chosen for their President the Carlisle Corporation Gas Engineer, and as they had among their company the President and Senior Vice-President of the Institution of Gas Engineers, and many other distinguished members of the gas industry. He trusted that in their inspection of the works they would find something that would be of interest and helpful to them in their profession. It was no mean achievement successfully to complete a large undertaking of this kind. He was assured by the Gas Engineer that not only had the contractors faithfully fulfilled their part of the work, but they had left no stone unturned to ensure the satisfactory starting of the plant. The works would last Carlisle for many years, and were another milestone in the history of the lighting of the city—commencing with the Corporation store-house for lamps in Lowther Street, on a site near the King's Arms Lane, then the formation of a Gas Company in 1819, the acquiring of the Company in 1850 by the Corporation at a cost of £15,480, with an output of 40 million c.ft. a year, and now the present undertaking costing £300,000, with a possible normal output of two million c.ft. a day. The consumers would be pleased, and he believed he was expressing the wishes of the whole of the members of the Gas Committee when he said that they hoped before very long to be in a position that would justify a reduction in the price of gas.



J. E. BLUNDELL, the President.

Engineer and Manager of the Carlisle Gas Undertaking.

Alderman FRED WEST asked the Mayor to accept, as a memento of the occasion, a silver salver. He hoped that day would mark what was going to be an epoch-making period in the history of Carlisle and its gas undertaking, and that they would never cease to look back upon that day's proceedings with the utmost satisfaction. The salver would remind the Mayor of the enterprise of the Council in extending their gas-works at a difficult period.

The salver, on which there was a representation of a vertical retort, was inscribed "Presented to Councillor A. Creighton, Mayor of Carlisle, on the occasion of the official inauguration of the Glover-West vertical retort installation at the Rome Street works, October 6, 1922."

The MAYOR said he had pleasure in accepting the salver, particularly because of the memories with which it would be connected. That day saw the crown of the public life of the Chairman of the Gas Committee, Alderman Buck.

The visitors then proceeded round the works, and witnessed the Mayor ascend the charging platform and open a coal-valve as the inauguration of the carbonizing plant. Alderman Buck later opened a discharging door and drew the coke.

THE LUNCHEON.

Luncheon was served in the County Hall, the Mayor presiding over a very large gathering. After the Loyal Toast, which was given with musical honours,

Mr. J. D. SMITH (Belfast), the President of the Institution of Gas Engineers, submitted the toast of "The Corporation of Carlisle and the Gas Undertaking." He said he believed the gas undertaking had been in existence for over 100 years. After their visit to the new gas-works that morning, all would join with him in congratulating the Town Council of Carlisle, and particularly the Chairman and members of the Gas Committee, on having added to their undertaking as modern and as fine a gas-works as could be seen anywhere in the United Kingdom. Though there might be financial critics who would suggest that the extensions had taken place during a period of very high costs, and for that reason perhaps should have been deferred, he submitted that the financial results would more than justify the Gas Committee in having taken the bull by the horns, and in having grappled with the situation that confronted them at the end of the war period. He felt confident that his brother engineers there would like him to congratulate the Gas Engineer, Mr. Blundell, on the excellent and masterly way in which the new works had been laid out, and upon the thoroughly good execution of the work under his supervision. As one of the earliest engineers in the United Kingdom to adopt the system of continuous carbonization in vertical retorts, it was only natural that he (the speaker) should note with satisfaction that Carlisle was to be served with the same type of apparatus as that which had been in use in Belfast for ten years, and which had realized very considerable economies. Carlisle benefited by later improvements which had been effected in the system; and as the future of every gas undertaking depended mainly on cheap gas and economies effected in carbonization, he thought Carlisle could look forward confidently to cheapening in the near future the cost of their gas supply.

Alderman J. P. BUCK, Chairman of the Carlisle Gas Committee, who responded, said that in the whole of his municipal life, extending to more than a quarter of a century, he had never come across a body of men so unanimous and so devoted to their business as the members of his Committee. As an undertaking, the gas industry at Carlisle had not been unknown; and though the works were not large compared with some, the men who had controlled the undertaking had endeavoured to keep abreast of the age, and they now saw their efforts consummated. They held their present Manager in the highest esteem,

and not only the Gas Committee, but the whole of the Council had the greatest confidence in his management and ability. Otherwise he did not think they would have entrusted him with the sum of £300,000—an amount of no little consideration to the city—to build an entirely new works. Mr. Blundell had led them well in times past—in stress and strain, and also when the sun shone. In the dark period of the coal strike last year, although they lost a lot of money, they did not stop the supply, an achievement which required some doing. Mr. Buck also referred to the excellent manner in which the contractors had done their work. It was only at the beginning of this year that the great mind who really introduced the vertical retort was laid to rest. It was his privilege to meet the late Mr. John West in company with their then engineer, Mr. Harold Bloor; and that visit would long be remembered by him. He (Mr. Buck) had been associated with gas making since his earliest days—now over fifty years ago, when his firm's works were situated in a small village about four miles from Carlisle. Crude though the installation was, it answered their purpose; and it was then that he learned the first principles of carbonization of coal, owing much at the time to the assistance and inspiration of the late Mr. Joseph Hepworth, then Engineer and Manager of the Carlisle Gas-Works. How much they owed to those who had preceded them was astonishing. Take, for instance, the position to-day in Carlisle with regard to the old works, which somehow they felt sorry to leave. By the provision of those who controlled the gas undertaking in the past, they now left the old works without a penny of debt, and they were in possession of the land, buildings, and machinery (whatever they might be worth), with all the storage holders, mains, gas standards, and utensils throughout the city, and a reserve account which at the moment stood at over £8000. It was during Mr. George Coulthards' régime as Chairman of the Gas Committee that much good work was done, and considerable assistance afforded to the rates of the city; but then he had as his compeers men like Mr. George White, Sir Benjamin Scott, and others who did yeoman service in what was at that time considered the most important Committee of the Council. It was fitting that the Mayor should be presiding over what he hoped might prove an historic gathering in Carlisle; for it was not a long time ago that the Mayor used the phrase that it was "time to scrap the gas-works." But this might be forgiven him, he being at the time a very active member of the Electricity Committee. [Laughter.] Well, the old works had been scrapped; and they were grateful to the Mayor, in his capacity as Chairman of the Finance Committee, for the manner in which he had enabled them to provide new capital for the new works. The gas industry had a great future; and it would help to solve the greatly debated question of pure air for our cities. Were it possible for factories and workshops to develop the steam power they required from oil instead of coal, at as cheap a rate as (or even cheaper than) at present, then, with gas for cooking and heating in their homes, the problem of smoke nuisance would be largely solved. This was why the Government were urging them to buy and sell gas by heat rather than by cubic feet; and there was no doubt that selling by therms was the only fair way of disposing of gas. That day saw the culmination of a great hope of his. For years he had seen that the only solution of their difficulties in regard to increased gas production lay in the erection of entirely new works; and he would always be pleased to remember that he had some little part in providing Carlisle for many years to come with the best installation for the production of gas that was in their power. [Applause.]

Alderman FRED WEST (Manchester) proposed "The North of England Gas Managers' Association," remarking that it was peculiarly appropriate that the meeting of the Association centred that day round Carlisle, and that the Association had as their President Mr. Blundell, the Gas Engineer of Carlisle. He did not think many altogether appreciated how closely the North of England Gas Managers' Association was connected with Carlisle. The Chairman of the Gas Committee had already referred to Mr. Hepworth's connection with the city. Mr. Hepworth was President of the Association as far back as 1878. Many present would remember Mr. Hardie, who was a Past-President and for many years occupied the important position of Hon. Secretary. One of the founders or early members of the Association was Mr. Booth, who in the seventies was at Middlesbrough, and was Mr. Blundell's chief at Southport. Mr. Blundell had deserved and earned his present position. It would be very pleasing to him that the installation had started in such a satisfactory manner.

Mr. BLUNDELL (who was received with musical honours), in reply, remarked that when Mr. West was referring to the speaker he felt very much like the man who went to have his photograph taken. On calling some days later he was handed a beautiful picture, and being informed that that was his photograph exclaimed, "Well, I didn't know I was like that." He would have to develop his Scotch side and obtain that gift which would enable him to "see hisel as ithers see him." However, he did appreciate the kind things that had been said about himself and the North of England Gas Managers' Association. They, as gas engineers in the North, were very proud of their Association. It had a long and useful history. On looking through the list of Past-Presidents, he found the names of many men who had distinguished themselves in the gas profession; and he could not tell them how proud he was that his fellow members should have considered him worthy to become their President for the current year. It was not many years since he came North; but during that period he had obtained valuable assistance and advice by attending the meetings of the North of England Gas Managers' Association. In these strenuous days there was a great need for conferences of men engaged in the gas industry. Speaking personally, the more knowledge he acquired the more he realized how much there was still to learn. The North of England Gas Managers' Association had for its object the advancement of all matters relating to the manufacture, distribution, and use of gas and of the residual products therefrom. The meeting of gas engineers with objects such as these was a very desirable thing, not only for the engineer himself, but for his employers and the large community who used the gas he manufactured. The progress made in all branches of the gas profession during the past few years was remarkable. Science had completely revolutionized the process of gas manufacture. The commercial side of the industry had been highly and efficiently organized. They had in the North of England their branch of the National Gas Council, the Federation of Gas Employers, and the Joint Industrial Council for the Gas Industry; and he had no hesitation in saying that the meeting together of employers' and workers' representatives had brought about a better understanding between employer and employee. Especially had this been manifest during the critical period through which they had lately been passing. They also held once monthly a meeting of the Special Purposes Section; and only those who had attended these meetings could realize their helpfulness and value. The gas industry had need of men with many talents. The successful gas manager to-day would have to be something more than an engineer. In addition to knowing all about the design, construction, and erection of gas-works plant, he would have to be an efficient chemist, for gas manufacture was a branch of chemical industry; he would have to know all about the distribution and use of gas, and the working-up and disposal of residual products; he would need to have commercial enterprise; and he would have to be well blessed with self-control. A good many people seemed obsessed with the idea that the gas manager was just a receptacle for complaints—that he, in fact, represented an industry that could be blamed for almost anything. He would like to say a word of appreciation and thanks to the contractors. They had done their work well; and they could have no better testimony than the manner in which the whole of the plant was put into operation. He should refrain from referring to any particular firm; but he must mention West's Gas Improvement Company. Every gas engineer in that room knew that Messrs. West could be relied upon to do a first-class job; and he wanted to say they had lived up to their best reputation. He would have liked to refer to two members of the firm who had worked hard and strenuously; but they particularly asked him not to mention their names. However, the fact that they were members of the North of England Gas Managers' Association had given him an additional pleasure. He would like to say how pleased he was to see Mr. Sayers there. He gave him valuable help in the early stages, and had interested himself in the completion, rendering him helpful assistance. As President of the North of England Gas Managers' Association, he desired to make reference to the loss the gas industry had sustained through the death of Mr. John West. To him, Mr. West was a personal friend. He was a man possessing remarkable vision and blessed with an abundance of energy. It was an epoch-making period for the gas profession when Mr. West decided to devote his energies to perfecting the system of coal carbonization they had seen to-day—the carbonization of coal in continuously operated vertical retorts. He owed all he knew about vertical retorts to Mr. John West. Well did he remember the first plant erected at St. Helens on which he worked. Mr. West never tired of instructing him. His energy and enthusiasm was an inspiration; and he wished to pay his personal tribute to the man above all others to whom he owed so much. He would say to the younger men in the gas profession: See that the standard so ably set up by the men who had gone before was maintained. There was still work to be done; and there was plenty of room for men to distinguish themselves as Mr. John West did. In conclusion, he would like to say how much he appreciated the confidence placed in him by the Chairman and members of the Gas Committee. They entrusted him with the erection of the gas-works they had seen that day; and that confidence made him put his whole being into the work. After all, a gas manager did not make so many cubic feet of gas for so many shillings. He had a right to expect a good remuneration for his services. But there was something higher than that—it was his employers' "Well done;" and he wanted to thank the Chairman for his kindly and encouraging remarks. No man could have had a better friend and supporter than Mr. Buck had been to him.

Mr. T. HARDIE, M.Inst.C.E. (London), proposed the toast of the Mayor of Carlisle.

His WORSHIP, in reply, said that Carlisle was an ancient city, and it was a progressive one. He did not know of any other municipality in the country which could claim to have carried out so many public utility services in the last 50 years. What they had seen that day would show them that the quietness and calm of a cathedral city was not to be found in Carlisle. He thought sometimes that it was due to the strong blend of the men from the North. In the sphere of gas Carlisle had not been behind, because (in 1850) when Carlisle approached Parliament to ask for power to acquire the gas undertaking, their application was looked upon as an innovation and more or less as an experiment. They must have had a good Town Clerk in those days (as they had to-day), for they found, during the next few years, the demands made upon his time in supporting the City of London and Glasgow in their applications for gas powers were so great that he almost forgot that Carlisle existed. [Laughter.] To-day engineers liked the therm and therm values; but public representatives easily felt the pressure of public opinion, and his advice to the Gas Committee was to leave therms alone for a short time. They had just managed to overcome one great obstacle, and they did not want any more trouble for a year or two. The young David, electricity, was making great strides, but he felt that King Coal could let his two children develop in their own way. They could both find scope for increased production. From the profits on their gas they owed their public baths in Carlisle; and the gas undertaking had handed to the city a legacy sufficient to provide pensions for their discharged workers. The old undertaking had handed to the city gasholders and a full set of gas-mains, and a sum of over £27,000, which they would shortly transfer to the capital account of the gas-works. That morning the Treasurer sent along to him a cheque which wiped-out the last halfpenny of capital standing on the old works, so that whatever might be the present value of the old works it was all profit.

THE BUSINESS MEETING.

This concluded the after-luncheon proceedings; and the members of the Association adjourned to the coffee room for their meeting, over which Mr. Blundell presided.

The Secretary read letters of apology for absence from Mr. W. Doig Gibb, Mr. W. T. Dunn, Mr. S. Shadbolt, Mr. H. H. Collett, Mr. C. Wood, Mr. T. M. Waller, and Presidents and Secretaries of kindred associations.

The following new members were elected: Mr. William Lowther Nicholson (Carlisle), proposed by Mr. J. E. Blundell, seconded by Mr. Norman S. Cox; Mr. Gill Heatherington (Pelaw Main Collieries Company), proposed by Mr. J. Lewis, seconded by Mr. William Batt, jun.; and Mr. R. C. Taylor (Bridlington), proposed by Mr. J. Kelly, seconded by Mr. Norman S. Cox.

Thereafter Mr. Blundell proceeded with his

PRESIDENTIAL ADDRESS.

First let me express my thanks to the members of the Association for the honour conferred upon me by my election as President. I am deeply sensible of the duties and responsibilities attached to the office, which has been filled by so many distinguished men; and you may rest assured that I shall endeavour to the best of my ability to follow their good example, to maintain the reputation of the Association, and to further its interests and usefulness. It is forty-four years since Mr. Hepworth occupied the presidential chair at the annual meeting of the North of England Association at Carlisle. It is therefore, I think, not improper that my address to-day should take the form of a description of the present position of the Carlisle gas undertaking, the reasons which led to the extensions which are now just completed, and the problems which arose in their design.

The Carlisle Gas-Works appear to have been among the first erected. An Act of Parliament, one of the first of the kind to be passed, received the Royal Assent in May, 1819, granting powers to a private company to erect a gas-works. The works were completed in February, 1820, at a cost of from £5000 to £6000. By the Carlisle Gas Act of 1850, the undertaking was transferred to the Corporation for the sum of £15,480; but adding the cost of promoting the Bill, the total outlay was £18,000. The site of the original gas-works had been sold to the Lancaster and Carlisle Railway Company in 1846. The construction of a new works had, therefore, been proceeded with on ground belonging to the Corporation; and these works have, with repeated extensions on the same site, served Carlisle with gas from 1849 to the present date. The growth of the undertaking is indicated briefly in the following table:

Year.	Gas Made. Cubic Feet.	Number of Consumers.
1850	40,000,000 ..	1,008
1870	80,071,000 ..	4,790
1890	198,907,000 ..	6,001
1921	432,215,000 ..	12,496

The growth since 1890 is shown in greater detail in the graph (fig. 1). In the same diagram is shown the growth in the maximum day's demand, which rose from a little over 1,000,000 c.ft. in 1890 to 1,715,000 c.ft. in 1918. As, therefore, the maximum capacity of the existing works, when I was appointed in 1918, was only one-and-a-half millions of coal gas and half-a-million of carburetted water gas a day, the necessity for extension was evident—quite apart from the fact that the existing plant was obsolete in type and expensive in operation. The subsequent continued growth of the maximum day's demand to 1,831,000 c.ft. on Dec. 24, 1921, has confirmed the expectation that the consumption of gas in Carlisle is not only growing, but likely to continue so to do.

It therefore fell to my lot to consider the question of extension; and the duty proved so interesting and instructive (as it must always to every engineer) that I feel sure it will commend itself as a theme worthy of the address made from this honourable presidential chair. The proposals and estimates were placed before the Gas Committee, and at my suggestion were submitted to an independent engineer, Mr. Wm. Newbigging, of Manchester, for examination and report; and in due course the Provisional Order approving the scheme was received from the Ministry of Health. Sanction was given to borrow £350,000 for purposes of a new gas undertaking, the period of repayment being fixed as follows: Buildings and foundations, retort-bench ironwork, washers condensers, governors, and piping—30 years; reinforced concrete water-tower, hoppers, tanks, &c., exhausters, and purifiers—20 years; retort-bench brickwork, machinery and boilers, furniture—15 years; station meter—10 years.

THE SITE OF THE ROME STREET WORKS.

The site for the new works had been already selected, and this choice was at once confirmed when it was found to possess all the necessary qualifications. It had admirable railway facilities for the handling of material in and out of the works; the level of the ground was low in comparison with the district to be supplied; the ground was not unsuitable for foundations; and there would be no interference with the amenity of the surroundings. The Rome Street site covers an area of 5·9 acres, in the shape of a right-angled triangle with a curved hypotenuse formed by the Maryport and Carlisle Railway, and the two sides by Rome Street and a private road to the refuse destructor.

The contract for the carbonization plant was placed, together with that for the whole of the foundation work and ferro-concrete work throughout the installation, in the hands of West's Gas Improvement Company; and during the summer of 1920, the site was surveyed by Mr. Burnard Geen, M.Inst.C.E., of Westminster, retained by the main contractors. The datum level of the site is 54·62 ft. above sea level. Some work had previously been executed there, comprising a sulphate plant, a foreman's house, and a three-lift gasholder of a capacity of 975,000 c.ft.; all dating back to 1878. The character of the subsoil had already been to some extent explored; but it was thought advisable, before commencing the new work, to sink seven bore holes. This was done in July, 1919, at a cost of £378. Generally speaking, the strata consist of a top covering of 3 ft. of soil, succeeded by a bed of gravel and sand of an average thickness of 12 ft., a layer of yellow sand about 6 ft. thick, a hard stiff homogeneous clay for a depth of some 27 ft., below which lies a bed of red sandstone at a depth varying from 45 to 50 ft. below datum. Probably due to the vicinity of the River Caldew, however, the ground is permanently water-logged to within 8 ft. of the surface. This was the main factor in deciding on pile foundations—avoiding excavation as much as possible. Owing to the further fact that the whole of the very extensive work of this character was to be carried through at the same time, it was found that piling would prove cheaper, on the whole, than any other type of foundation.

GENERAL CONSIDERATIONS.

Referring to the graphs on fig. 1, it will be seen that over the graphs of the real statistics for annual make and maximum daily demand I have plotted what may be termed the curves of averages. These curves represent the true rates of increase as far as these can be shown apart from merely accidental causes. It will be seen that in 1919 the demand, on this secondary graph, was 405 million c.ft., and the maximum daily demand was 1,650,000 c.ft. Prolonging these graphs to (say) 1930, we can foretell, as far as is humanly possible, that the annual demand may be expected to rise to 560 million c.ft., and the maximum daily demand to 2,300,000 c.ft. The effect of these considerations is to justify our decision to put down carbonizing plant of a daily capacity of 2 to 2½ million c.ft., with ready means of extension to 3 to 4 millions and auxiliary plant generally of a daily capacity equivalent to 3 millions. It is interesting to note in passing that the ratio of annual to maximum daily demand has increased from 200 in 1890 to 250 at the present day, indicating that the consumption of gas is better distributed over the year than it used to be. The causes of this are, of course, well known; but it is not out of

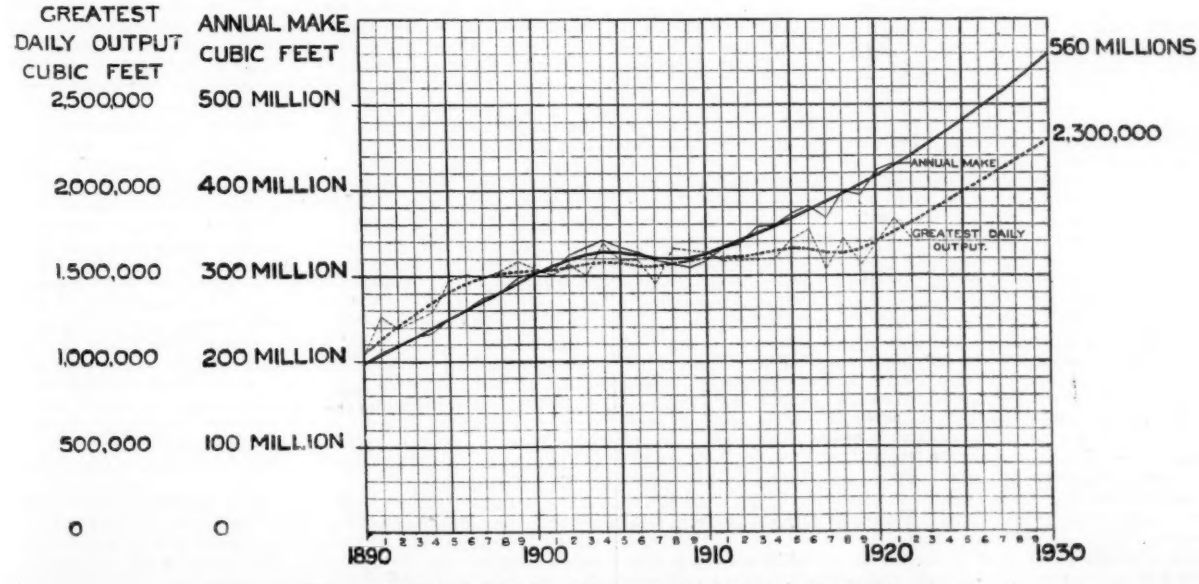


FIG. 1.—ANNUAL YIELD OF GAS FROM CARLISLE GAS-WORKS.

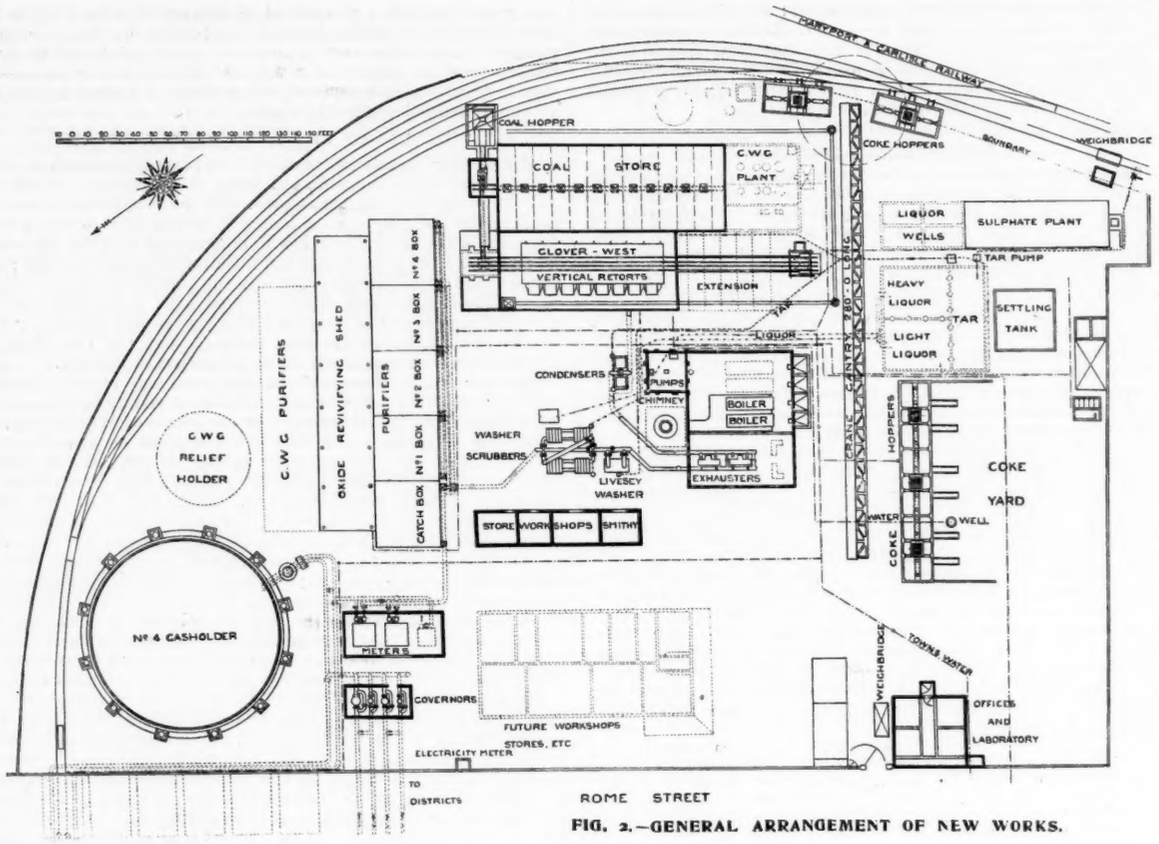


FIG. 2.—GENERAL ARRANGEMENT OF NEW WORKS.

place to draw attention to the striking manner in which these curves show how well worth while it is to encourage those uses of gas for cooking and other purposes which tend to equalize the summer and winter demands.

The general arrangement of the new works is shown in fig. 2; and I propose to run over a number of the installations, and state briefly the reasons for the decisions arrived at in each case, as far as it is likely to interest you.

Railway Sidings.—The lines of the Maryport and Carlisle Railway Company, with which are connected the main English and Scotch systems, embrace the outer side of the curved base of the site, and a cross-over road has been constructed to communicate with the gas-works sidings. The latter, which have a total length of about 990 yards, diverge on entering the works into three distinct parallel lines, following the inside of the curved base, and converge again at their furthest point in the works, at Rome Street. The inner line is the reception siding; the outer line is the dispatching siding; and the middle line is a free running loop. It is thus possible for a locomotive to draw its train of coal wagons along the inner reception line, and to uncouple and retire along the middle line, even when the outer line is occupied by filled wagons awaiting dispatch. The sidings were constructed by the Maryport and Carlisle Railway Company. They were commenced on May 25, 1920, and opened for traffic exactly a month later. A 60-ton Pooley weighing machine has been provided at the entrance to the sidings. At the Rome Street extremity the lines run into an archway (25 ft. wide by 40 ft. long) under Rome Street, and this forms the locomotive shed. It has an inspection pit, and is heated by water coils from a coke-fired boiler. A weighbridge is also provided at the main entrance for dealing with traffic by road.

Carbonizing Plant.—It will not surprise anyone that, after my ten years' experience with continuous carbonization, I should have no hesitation in installing continuous vertical retorts in the new works; nor will any reader of my paper of October, 1917, be surprised that I should adopt the Glover-West system. In my report to the Carlisle Corporation I had no difficulty in showing that by the adoption of continuous vertical retorts there would be a total annual saving in manufacturing costs of £16,486, or 9·89d. per 1000 c.ft. Since the date of my report, in which the calculation of economies to be effected was based on the rates prevailing at the time, some adjustment may be necessary. But, while these figures are perhaps worth placing on record as showing the comparison between the results of the older methods previously in use at Carlisle—and typical, no doubt, of a great many works which have not yet been modernized—with those which can easily be realized by the adoption of modern methods, they have hardly any direct interest to-day. A statement of the number of men required for a maximum day's make of 2,500,000 c.ft. will be of more interest [*vide* next column].

The continuous vertical retort, when suitably arranged and heated, is an instrument by which any desired grade of gas can

Manufacture.		Maintenance.	
24	12 Stokers.	8	1 General foreman.
	3 Exhauster, boiler, and governor men.		1 Chief mechanic.
	1 Loco. driver.		1 Assistant mechanic.
	1 Shunter.		1 Mechanic's labourer.
	2 Elevator men.		1 Retort setter.
	1 Greaser.		1 Joiner.
	4 Coke-plant men.		1 Blacksmith.
			1 Blacksmith's striker.

General (Unskilled Labour).

14	12	Labourers.
	1	Mess-room attendant.
	1	Tar and liquor man.

46 Total.

be produced within sufficiently wide limits for all practical purposes. Exactly what grade of gas should be made in any given works depends entirely on the relative prices of coals and residuals. But there is no doubt in my mind that in the long run the quality of gas for which the plant should be designed is that quality which is most efficient in consumption and at which it can be most cheaply produced under normal price conditions. It is useless to approach the question from the point of view of a period during which coke was sold at abnormal prices, such as those which have ruled for considerable periods during the last few years. Does anyone doubt that we are now rapidly approaching a period of stability in these conditions? Does anyone seriously doubt that, subject to the quality of gas being efficient in the hands of the consumers, the maximum output in therms per ton of coal and per unit of plant and capital expenditure is the ideal quality to be aimed at? What is that ideal quality? I believe that the researches of the Investigation Committee of the Institution of Gas Engineers, corroborated by almost everyone who has approached the question from a scientific point of view, have proved that a gas of a calorific value from 400 to 450 B.Th.U. per c.ft. is the ideal under any conditions likely to prevail within the next few decades. My pioneer work at Macclesfield convinced me that the continuous vertical retort, properly heated, can be used to very great advantage when it is applied to the simultaneous generation of water gas in the same retort and without any interruption to the process of dry distillation—particularly if heated sufficiently towards the base of the retort, so that the steam introduced is converted into hydrogen and carbon monoxide, and not carbon dioxide. It is an old story now; and everyone is familiar with the work done by the late Mr. John West, by the Gas Investigation Committee of the Institution of Gas Engineers at Uddingston, and by the Fuel Research Board at East Greenwich.

The natural result of these researches was to prove that we have, in the continuous vertical retort, an apparatus by means of which straight gas can be diluted with water gas to any desired extent without the extra capital and labour costs involved in the continual operation of a separate water-gas plant. Further,

though this is not done without some decrease in the quantity of coke for sale, it must be borne in mind that in the vertical retort the water gas is generated under nearly theoretical conditions. Up to a certain point the residual heat of the coke in the retort itself is sufficient to provide heat for the reaction, so that the loss due to the blow period of the water-gas plant is eliminated.

At this date it is not necessary to argue over again the merits of 400 or 500 B.Th.U. gas. The only point which appears still to require some illustration is whether it pays to make the sacrifice of a comparatively small quantity of coke involved in turning out 450 gas, by the only really satisfactory method—that of steaming in vertical retorts. One can understand the position of those engineers who have tried to realize the benefits of the production of large volumes of gas per ton at a comparatively low value, having only at their disposal horizontal retorts with or without the assistance of a water-gas plant. In the former predicament the additional gas has been generated at a considerable cost of coke, labour, and upkeep; and in the latter, although extraordinary claims have been made, it is difficult to see how gas at 450 B.Th.U. can be generated at all in horizontal or inclined retorts, except by prolonging the distillation period by some hours, during which rapidly diminishing quantities of gas of a very poor quality are evolved—unless, indeed, it is by the adoption of certain methods which bear some resemblance to vertical retort practice. But let us compare some of the best claims made for the intermittent methods of generating straight gas with some of the moderate claims made for the continous system.

Straight Gas.—It will be admitted, I think, that 70 therms per ton, at the rate of 13,200 c.ft. of 530 B.Th.U. is an excellent result in the most modern horizontal retorts fully equipped with machinery. Assuming the gas is sold at 5s. per 1000 c.ft., or 11½d. per therm, the gas made per ton will realize £3 6s.

Vertical Retort Gas.—With coal of equal quality, it should be possible with steaming to make 20,000 c.ft. of 450 B.Th.U., or 90 therms per ton, in everyday practice. The gas could be sold, and is sold, at prices per 1000 c.ft. equal to, if not more than, those charged for straight gas; but let us assume it is sold at the same price per therm. The sales of gas per ton then would realize 90 times 11½d., which is £4 6s. 3d.

Coke.—One often sees claims of 12 cwt. of coke per ton available for sale at works using horizontal retorts. This is 60 p.ct. by weight of the coal carbonized. Adding 15 p.ct. for fuel consumption, we get a total make of coke of 75 p.ct. It is evident that much of this must be water; but we will admit the figure in the present comparison. Assuming that the average price of 25s. per ton is obtained for the whole of the coke and breeze available for sale, we should get 15s. as the amount realized by the sale of the coke derived from the carbonization of a ton of coal. Vertical retort coke is harder and closer in texture, and with the best will in the world it is not possible to get so much water into it as in the softer cokes made in horizontal and inclined retorts. Still, it must be taken that, even when steaming to the extent suggested, there will be 10 cwt. of coke available for sale. It is a better fuel, and purchasers prefer it where both are available. The value at the same rate is 12s. 6d. per ton of coal carbonized.

Tar.—The yield of tar is very largely governed by the nature of the coal carbonized; but in my experience, with the same coal the yield would be increased from 10·5 to 16·5 gallons per ton. The value at 55s. per ton, or 3·19d. per gallon, would be increased from 2s. 8½d. to 4s. 3½d. per ton of coal carbonized.

Ammonia.—Speaking with the same reservation as in the case of tar, the yield should be increased from 21 lbs. to 28 lbs. of sulphate per ton; the corresponding values, at the ruling price of £15 per ton, being 2s. 9½d. and 3s. 9d.

To show the saving effected by the new methods, I have collated these figures in the same form as that adopted in my paper of October, 1917, and on the same basis of the price of coal, 28s. per ton, which is being paid to-day in Carlisle; but instead of assuming the same yield in cubic feet of gas, I have this time assumed the same yield in therms.

Table Showing the Net Cost of Coal on an Annual Output of 2,650,000 Therms.

—	500 Million C.Ft. of 530 B.Th.U.		600 Million C.Ft. of 450 B.Th.U.	
		£		£
Gas made per ton of coal carbonized .	13,200 c.ft.	—	20,000 c.ft.	—
Therms made per ton	70	—	90	—
Coal carbonized at 28s. per ton . . .	37,900 tons	53,060	30,000 tons	42,000
Residuals—				
Coke, per ton . .	12 cwt.	—	10 cwt.	—
Annual yield at 25s. per ton . . .	22,740 tons	28,425	15,000 tons	18,750
Tar, per ton. . .	10·5 gals.	—	16·5 gals.	—
Annual yield at 55s. per ton . . .	1,922 tons	5,285	2,391 tons	6,575
Ammonium sulphate, per ton .	21 lbs.	—	28 lbs.	—
Annual yield at £15 per ton . . .	355 tons	5,325	375 tons	5,625
Total residuals . .	—	39,035	—	30,950
Net cost of coal . .	—	13,025	—	11,050

There is, thus, on the basis of a comparison which must be admitted to be biassed in favour of the horizontal retort, a saving of not less than 15 p.ct. in the net cost of coal, and nearly 8000 tons of coal per annum in a nominal 500-million works. But 15 p.ct. by no means represents the whole of the saving. The savings in labour costs—not only in a less cost per 1000 c.ft. of gas made in the retort-house or per therm—in the handling of a smaller quantity of coal and coke for the same annual output, in the wear and tear of the machinery (which is very heavy in the case of stoking machinery for horizontal retorts), and in that of conveyors for hot coke—all these, if difficult to put into accurate figures without an actual case on which to base them, must tell heavily in favour of the continuous vertical retort with its high yield of therms per ton, its simple (almost negligible) machinery, and the absence of the problem of dealing with hot coke.

THE ROME STREET CARBONIZING PLANT.

Coal is brought into the works, over the weighbridge in the south corner, in bottom-opening wagons, which are discharged into a coal-receiving hopper at the north-east corner of the coal-store. It is fed, by means of a reciprocating tray, into a breaker with one pair of coarse claw-rollers, by which it is broken to 4 in. to 6 in. cubes. From the breaker the coal is delivered to a fixed-bucket elevator, which raises it for delivery either to the gravity-bucket conveyor for filling and emptying the store or direct to the coal breaker, where it is reduced to 1½ in. cubes for use in the retorts.

The coal-store is constructed in reinforced concrete, and is capable of containing 4000 tons of coal, or about 21 days maximum requirements. It is equipped with a 50-ton per hour gravity-bucket conveyor passing above and below.

From the second breaker the coal is delivered, by means of a band conveyor, to a weighing machine at the end of the retort-house. From the weigher the coal is elevated to, and distributed in, the bunkers above the retort-bench by means of one of the duplicate lipped-bucket conveyors, which return below the retort-bench for the purpose of dealing with the coke from the coke-chambers. These conveyors are in duplicate, so that coal and coke can be handled simultaneously.

By the lip-bucket conveyor the coke is delivered either to hoppers, for the supply of the retort-bench producers, or to an automatic skip-filling apparatus at the south-west corner of the coal-store, through a coke-cutter, which can be bye-passed at will.

At right angles to the line of the retort-house, and extending from the railway for a distance of 280 ft., is a reinforced concrete gantry, 24 ft. 6 in. to the rail level, on which runs an electric locomotive crane manufactured by Messrs. Cowans, Sheldon, & Co., capable of dealing with 2-ton loads at a radius of 35 ft. The bottom-opening skips are discharged by the crane-driver over screens into either of two 100-ton reinforced concrete hoppers arranged alongside the railway, or into a battery of three similar hoppers placed alongside the coke yard near the main entrance and constructed of the same material. The latter hoppers are provided with shoots for road traffic, with overflow shoots to the yard. Ferro-concrete hoppers are also provided within reach of the crane for supplying breeze to the boilers or coke to the C.W.G. plant.

The retort-bench consists of eight settings containing 64 Glover-West vertical retorts, each setting provided with a chimney, and each chimney provided with a waste-heat boiler for supplying the steam for introduction to the retorts. The Glover-West vertical retorts have been so often described, and are generally so well known, that it is not necessary to take up your time with any details now. It should, however, be mentioned that the Glover-West setting has been considerably developed in the light of recent investigations; and the designers have every reason to congratulate themselves on keeping in the forefront both from the point of view of economical working and in maintaining their lead in the correct and satisfactory heating of the retorts.

REINFORCED CONCRETE.

At this point it may be well to digress somewhat to remark on the comparatively large use of reinforced concrete in the new construction at Rome Street. The coal-breaker pit, coal-store and conveyor tunnel, retort-house foundations, water tower and pump-house, foundations for the boiler chimney, crane gantry, three sets of coke-hoppers, breeze hoppers for the boilers, and the underground tar and liquor wells are all constructed in this material.

At one time some explanation would undoubtedly have been necessary of the free use of ferro-concrete; but nowadays it may be stated definitely that, provided the work is placed in the hands of a reliable engineer, the gas industry need have no hesitation in using it. Its advantages for underground work, for coke-hoppers, and for all constructions of a substantial nature where corrosion is a source of danger, are so obvious, that no further comment need be made, except to say that, generally, it is as cheap in first cost as steel structural work at present prices.

One or two of the details in ferro-concrete call for further mention. The advantages of piles for foundations are not to be overlooked, even where there is no great depth with which to contend. You avoid excavation which would be a serious item, even down to not more than 10 or 12 ft., especially in a water-logged subsoil. You also know definitely to what extent the subsoil is loaded, since it is easy to stipulate that piles shall be driven to a definite "set." Where a considerable amount of foundation

work is to be done, you save in first cost over either mass concrete or a ferro-concrete raft.

In the present case Simplex concrete piles were used. In this system a withdrawable steel tube, about 16 in. internal diameter, provided with an oval point, is driven into the ground to the desired set, and the reinforcement and concrete are placed in the tube. The oval point, known as the "alligator jaw," remains closed while being driven; but on withdrawing the tube, the overhung steel-wire hinges cause the halves of the jaw to open to the full diameter of the tube, and allow the reinforced concrete to remain in the ground. The advantage of this system over pre-cast piles is mainly that the time of casting and maturing is saved; the piles mature in the ground. Piles to the number of 433 were driven and cast in connection with this work.

The coal-breaker pit was sunk by ordinary close-timbered excavation through the clay down to the gravel below; pumping being carried on, and the railway kept in use, until concreting commenced. As soon as the concreting in the bottom and side walls commenced, the use of the railway was discontinued, so as not to interfere with the set of the concrete. When the walls were complete, pumping was discontinued, and the pit was flooded to balance the water pressure outside. After the concrete was thoroughly set, the water was pumped out, and the pit was found to be perfectly water-tight without recourse to any special surface treatment. The concrete throughout was mixed in the proportions of three of crushed granite, graded through a ¾-in. mesh, to one-and-a-half portions of washed, screened sand, to one portion of "Ferrocrete" cement—all portions by bulk.

The design of the coal store and conveyor tunnel presents some novel features. The top gallery carries the gravity-bucket conveyor for filling the store, and the sloping roof below is fitted with open ventilators. The side slopes of the roof are inclined inward to form a large snow-gutter on each side. The melted snow or rainwater is taken away through downpipes arranged at the ends of the building. The whole structure is monolithic and internally braced against the outward pressure of the coal. The side adjacent to the retort-house is arranged to take the steel substructure of the retort-house building side wall.

The retort-bench foundations consist of a group of piles joined together by a continuous ferro-concrete cap on the producer side; and the loads from the stanchions on the other side are carried upon groups of five piles, with a ferro-concrete cap to each group.

No difficulty was experienced in making the tunnels below the coal-store and the retort-bench water-tight with a concrete similar to that described for the coal-breaker pit. The remainder of the concrete was mixed in the usual proportions of 27 c.ft. of granite, crushed to ¾-in. cube, 13½ c.ft. of clean sharp sand, and 6 cwt. of "Ferrocrete" cement.

The water-tower consists of a reinforced concrete tank, octagonal in plan, capable of containing 50,000 gallons of water, at a head of 35 ft. above datum; it is built in two distinct compartments to provide for periodical cleaning. The pump-house is arranged within the supporting columns, and the roof of the house forms one of the tiers of horizontal bracing of the tower structure. The nine columns are carried upon 21 piles suitably tied together in both directions at the ground level. The floor of the pump-house is of concrete raised above the yard level.

The 150 ft. chimney for the boilers is supported on a concrete cap 3 ft. 6 in. thick carried upon 29 ferro concrete piles. The total resultant pressure of the chimney on the foundations, allowing for wind pressure, is 632 tons. Allowing for the weight of the foundations and superimposed soil, the total load upon the piles is 815 tons.

The crane gantry is 280 ft. long by 9 ft. 8 in. wide, and 24 ft. 6 in. from yard to rail level. It has been very carefully designed by Mr. Geen, in view of the complex stresses likely to be induced by the working of the 2 ton electric locomotive crane; thorough provision being made for stresses due to the travelling, acceleration and retardation, and the hoisting and slewing motions of the crane. The 56-lb. rails are laid on longitudinal timber sleepers attached to the ferro-concrete. Each column of the gantry is supported by a ferro-concrete pile constructed as previously described. These are tied together in both directions, except in the case of four of the columns adjacent to the underground tar and liquor wells, where it was necessary to go down to the solid with mass concrete.

The coke-hoppers call for no particular comment to an assemblage of gas engineers, except in so far as to draw attention to the arrangement of them in relation to the railway and the main entrance by road.

The tar and liquor wells, however, may be of some interest. They consist of an underground tank 63 ft. by 63 ft. by 12 ft. internal depth, of a total capacity of 273,000 gallons, constructed in ferro-concrete throughout, and divided into three distinct compartments (as shown in fig. 3). Tar and liquor flow together from the retort-house to a "Dempster" separator, whence the tar flows to the first compartment, extending the full width of the square tank, with a capacity of 93,000 gallons. The liquor from the separator flows successively into two further compartments, each of 90,000 gallons capacity. There is an overflow from the last compartment to the adjacent existing wells.

The material was of the same high grade as used in the coal-breaker pit, and there was no difficulty in making a water-tight job without any special treatment. As a precaution, however, the bottom of the excavation was covered with 6 in. of concrete, and

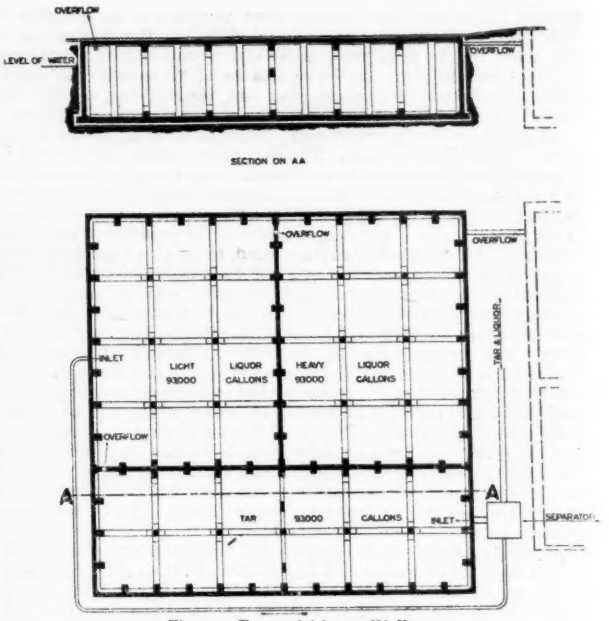


Fig. 3.—Tar and Liquor Wells.

the interior was washed-over with dehydrated tar immediately on completion.

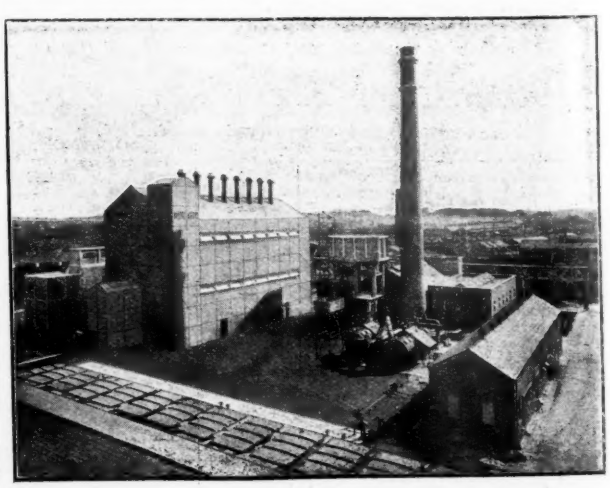
Precautions were also taken against possible flotation during construction in a subsoil which is water-logged to within 8 ft. of the surface. Continual pumping was necessary. One temporary flooding and balance valve was left in each of the three compartments, to balance the water pressure in the event of an accidental stoppage of the pumps. On one occasion the pumps stopped and the work was flooded, with the complete avoidance of any injurious result.

The tanks as a whole are designed as a stiff hollow box to carry water pressure on the outside when empty, and the total weight is arranged to be sufficient to resist flotation. All necessary inlet and outlet valves and manholes are provided to the several compartments.

MISCELLANEOUS PLANT.

The electricity supply, in the form of direct current at 460 volts, for the actuation of the whole of the machinery for coal and coke handling, as well as a few other general purposes about the works, is obtained from the generating station of the City Corporation electricity undertaking. I am convinced that it is much better, especially in corporation undertakings, to use the current generated by the same corporation than to put down a small generating unit in the gas-works, because, although the current is generated very cheaply, the load factor is low, and correspondingly the annual efficiency. The electricity industry has now almost entirely eliminated the risk of failure in public supply.

The condensers are of the reversible type in two towers, with a capacity of 3 million c.ft. of gas per day, and were constructed by Messrs. Clapham Bros. The arrangement of the connections both of gas and water is such that either tower can be used alone or both in series, either first. The condensing water after use is passed to the boiler-feed; and it is estimated that about 70 p.ct. of the heat removed from the gas will be available in the form of heated feed-water to the boilers.



The Rome Street Works; from the North.

Two boilers of the Lancashire type, 8 ft. dia. and 30 ft. long, have been supplied by Messrs. Galloways—fitted with forced-draught apparatus by Messrs. Goodrich and Hamlyn, and super-heaters by the same firm. The grates are suitable for burning breeze. Space is left for the future installation of economizers if deemed desirable. The chimney is 150 ft. high by 5 ft. 9 in. internal diameter, and is built in brick on a pile foundation. The boiler-house is of sufficient capacity to contain two other boilers of the same size. One gable-end of the house is formed by the structure in ferro-concrete supporting the breeze hoppers, and the structure of the water tower forms a portion of the other gable-end.

Pumps are provided for the boiler-feed, for feeding the waste-heat boilers of the vertical retort plant, for the circulation of tar and ammoniacal liquor, for the delivery of tar to railway tank-wagons, and for drawing the water supply from the River Caldew and from a well on the site.

The boiler-feed pumps are by Messrs. G. & J. Weir, Ltd., of Glasgow, who have also supplied one of their "Multiflow" feed-water heaters, in which water already heated in the condensers is also heated by the exhaust steam from all the pumps and from the exhausters. It is capable of dealing with 2000 gallons per hour under the pressure of the pumps against the 120 lbs. boiler pressure, and is placed in a convenient position at the back of the boiler-house between the feed-pumps and boilers. It is fitted with a bye-pass, so that feed-water can be sent direct to the boilers whenever it is necessary to shut-off the heater for examination or cleaning.

The water-softening plant has been supplied by Messrs. United Water Softeners, Ltd., and is capable of reducing the hardness factor of the natural water supply from 11½ to 4, with a capacity of 2000 gallons per hour.

The exhausters are of Messrs. Bryan Donkin's manufacture in two complete sets, each consisting of two horizontal steam engines, each driving two exhausters of the four-blade type. Each exhauster is capable of dealing with 1¼ million c.ft. of gas per day when running at 78 r.p.m. against 30 in. water pressure. The speed of the engines is controlled by hydraulic regulators, which respond immediately to any change of conditions, either in steam pressure or the quantity of gas coming over from the retorts. The main connections are 24 in. bore; and a 24 in. self-acting bye-pass valve is provided between the inlet and outlet mains.

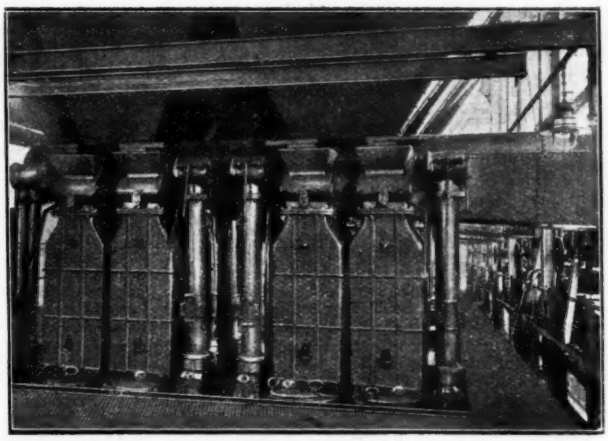
Interior of Coal Store.

The exhauster-house is sufficient in capacity to permit of the duplication of this plant. It is constructed with overhead girders, with lifting appliances for manipulating the machinery during repairs and with a stage floor, beneath which the mains are accommodated, being thus easy of access. In the same building a meter blower is installed for supplying the air used for revivification *in situ*. It is capable of delivering 2½ p.ct. of 2½ million c.ft. per day against a 30 in. pressure.

The tar extracting and washing plant has a capacity of 3 million c.ft. of gas per day, and is fitted with bye-pass connections arranged to provide for future duplication. The tar-extractor is of the usual Livesey design, and is placed at such a level relative to the washer-scrubbers as to permit of the overflow liquor from the latter being run through the tar-extractor before entering the wells, thus avoiding the necessity of pumping.

The ammonia recovery apparatus consists of two Holmes brush scrubber-washers constructed on their "two-unit" system, each unit consisting of five double-washing chambers coupled to a central driving gear and horizontal steam-engine. The bye-pass connections are arranged overhead, enabling all drains and syphons to be dispensed with and giving complete access to the valves for inspection and cleaning. The two machines can be worked in series or in parallel.

The purifiers (by Messrs. Clapham Bros.) consist of a set of four boxes, each 40 ft. square by 6 ft. deep, arranged for series working, and a fifth or catch box of the same dimensions, built in one unit on a concrete bed, with a shed 175 ft. by 30 ft. immediately adjoining. The whole of the boxes are fitted with three tiers of wood grids. There are six covers to each box; and these, being exposed to the weather, are of substantial construction. The sheets are ¼ in. thick, cambered 3 in. in the centre, to secure stiffness and to allow rain water to run-off with ease.



Charging Stage of Glover-West Vertical Retort Bench.

The joints between the covers and boxes are of Clapham's "Eclipse" type; and the cover-lifting apparatus is of the usual design. As it is estimated that the purifiers will run for many months without changing the oxide, and as we had plenty of room available, I arranged the purifiers on the ground, thus avoiding the large additional outlay involved in the overhead system.

One new station meter, of a capacity of 70,000 c.ft. per hour (of Messrs. Braddock's manufacture), has been installed. The existing meter of 60,000 c.ft. capacity will be removed, overhauled, and re-erected on the new site.

Four station governors, of Messrs. Parkinson's manufacture, have been installed—one 24 in., one 18 in., and two 12 in.

Mains and connections have been included in the scheme, comprising 24 in. gas mains on the works, mains in the district (including a culvert under the railway), tar and liquor mains, water-mains, including the main supply pipe from the river, steam and exhaust pipes.

The workshops and stores, and the sulphate plant do not call for any particular mention.

The existing carburetted water-gas plant (manufactured by Messrs. Humphreys and Glasgow) is to be thoroughly overhauled, removed from its present position, remodelled and increased in capacity from 600,000 c.ft. to one million c.ft. per day. A new relief holder and turbo-blower will be installed. This work will be deferred until the remainder of the plant is finished.

CONCLUSION.

I hope that the foregoing description and the reasons given for the selection of the several pieces of apparatus have been intelligible and interesting to those who have seen the works which it has been my privilege to lay-out.

Gas-works problems are to be judged from the point of view of gas in its new form as a heat agent. The production of therms in the form of gas which is the most economical to use and cheapest to make should be our sole aim and object. In the circumstances which exist, or are likely to exist in the immediate future, there appears to be no contradiction that this ideal gas will have three essential properties:

1. Its calorific value will lie between 400 and 450 B.Th.U.
2. It will have a constant composition.
3. It will be supplied at an adequate and constant pressure.

The Rome Street Gas-Works, Carlisle, have been designed to manufacture and supply a gas to come up to that specification.

It is necessary for us to keep up our faith in gas in these days, if only because there is an increasing number of gentlemen looking into the question of fuel (of domestic fuel in particular), with a view to solving the smoke problem. Some of these gentlemen know little of the gas industry, and therefore are unaware of the fact that it has offered a solution to this problem for years. Legislative restrictions have prevented us from producing gas as cheaply as we might have done. But this difficulty has now been removed. At last the Legislature has agreed to the proposition put forward for so long—that gas should be sold on a heat basis. In a word, the gas engineer is now authorized to sell heat.

Heat brought to the household in the form of gas has such advantages over the solid smokeless fuel, on which the public are now being so sedulously educated, that it may be well to state

them over again, even to an audience which is perfectly familiar with them.

1. Gas does not require to be carted through the streets.
2. It does not require to be manœuvred into cellars with holes and shoots all too small to receive it.
3. It does not require to be fetched up from these cellars in buckets.
4. It does not require chips and paper, or firelighters to kindle it in the morning.
5. It does not require to be lighted until it is wanted, nor need to be kept alight after it can be dispensed with.
6. It contains no dust.

I submit that gas is the solution to the smoke problem, and that we need have no fear but that the gas industry is destined to be the universal supplier of heat for all domestic and many industrial purposes.

VOTE OF THANKS TO THE PRESIDENT.

Mr. JOHN KELLY (Bridlington), moving a vote of thanks to the President for his address, said it did not fall to the lot of many gas managers to be able to come down heavily on one side of the fence or the other, but Mr. Blundell had had the opportunity in Carlisle. He had had the chance of building modern, up-to-date works. He made up his mind as to the type he wanted; and he thought all present would agree that he had got a very fine type of the particular plant to which he pinned his very robust faith. He was confident in the future of gas, and the kind of gas the future demanded, and they would probably all support him in what he said, and, at the same time, congratulate him on the mental food he had provided. It was good to see the quiet way in which modern gas-works were carried on. He was very much struck by the absence of noise, even when the machinery was running. He did not think that modern gas-works placed among residential property would become a nuisance. The works were a fine example of engineering skill, and of the way the amenities of life were catered for.

Mr. NORMAN REID (Redheugh, Gateshead) seconded, and remarked that they had had a splendid day. I had been interesting and instructive; and his only regret was that he had not had a little more time to spend at the works.

The vote being carried with acclamation, the PRESIDENT said he had had a time of great anxiety in constructing the works, and he was delighted that everyone was satisfied with them. He looked forward to the occasion when many of them would visit the works and spend more time there.

EDUCATION AND CERTIFICATION OF GAS ENGINEERS.

Mr. WALTER HOLE (London) then explained to the meeting the Institution of Gas Engineers' scheme for the education and certification of gas engineers. He said that some years ago the Board of Education took action which brought them up against this question. Up to that time splendid work had been done in London by the City and Guilds of London Institute. They could have constituted themselves a teaching and examining body; and it would be realized that the Institute did wisely in saying: "No, we cannot accept such responsibility." The only other alternative was to work in connection with the Board of Education—to use the technical institutes of the country, and to obtain as large a measure of control for the teaching and for the awarding of certificates as it was possible to secure. The scheme which had been circulated was the result of the deliberations of the Committee formed to consider the matter. He thought they had very considerably safeguarded the industry. They had not only secured equality and uniformity, but they had also secured co-ordination of control. They had got a grip of the whole subject through the advisory Committee which was now set-up.

Tea was served later in the County Hall; and here a vote of thanks was accorded the Chairman and members of the Gas Committee of Carlisle.

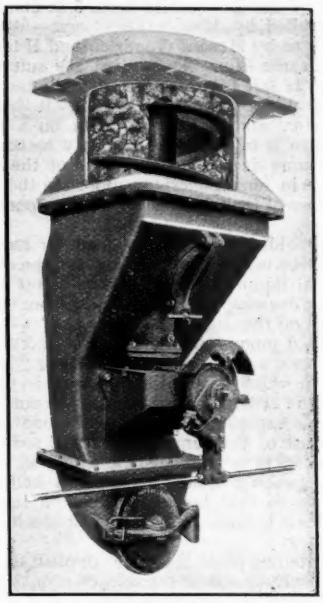
THE ROME STREET WORKS.

The following details, taken from a fully illustrated description of the works prepared for the opening ceremony, will supplement the information embodied in Mr. Blundell's Presidential Address.

Mr. Blundell was appointed Engineer and Manager in 1918, and early in 1919 it was decided to proceed with the construction of the Rome Street works, on a site which was already in possession of the Corporation, and on which a gasholder and some other apparatus had been erected. The contract for the carbonizing plant was placed, together with coal and coke handling machinery, and the whole of the foundation work and ferro-concrete work throughout the installation, in the hands of Messrs. West's Gas Improvement Company; and during the summer of 1920 the site was surveyed. As the ground is usually water-logged to within 6 ft. or 8 ft. of the surface, it was decided that pile foundations should be generally adopted.

COAL-HANDLING PLANT.

Coal is received on the inner line of the sidings in hopper-bottom wagons, the contents of which are discharged into a 10-ton receiving hopper supported in the coal-breaker pit. A reciprocating tray feeder with adjustable stroke, placed at the mouth of the receiving hopper, delivers the coal at the rate of about 50 tons per hour to a West single-claw breaker, by means of which it is reduced to from 4 in. to 6 in. cube. The broken coal drops into the boot of a fixed-bucket elevator, which raises and conveys it to a system of shoots above the secondary breaker, also of the

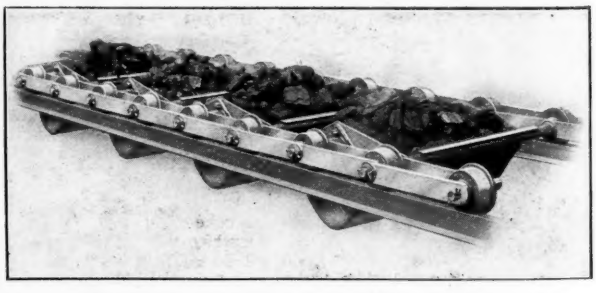


Glover-West Coke Extractor.

West single-claw type. These shoots are so arranged that the coal may be delivered from the elevator to a gravity-bucket conveyor and distributed in the coal store, or it may pass straight to the secondary breaker, by which it is reduced to the size (1½ in. to 2 in. cube) suitable for the carbonizing plant; or it may be taken from the coal store by the same gravity-bucket conveyor and delivered to the secondary breaker. The broken coal is received from the breaker on a 2 ft. wide flat band, which elevates and conveys it to a weighing machine arranged at the end of the retort-bench, and thence to either of the two lip-bucket conveyors which encircle the retort-bench, elevating and storing the coal in overhead bunkers containing 48 hours' supply for the retorts.

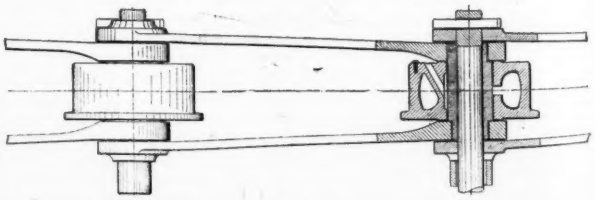
COAL STORE.

The coal store is designed to contain from 3000 to 4000 tons of coal. It is provided with a top gallery carrying the upper strand of the gravity-bucket conveyor, and a tunnel below the floor for the lower strand. In the portion of the floor forming the roof of



The West Lip-Bucket Conveyor.

the tunnel are twelve hopper-mouths with duplex coal valves, by means of which coal from any part of the store can be admitted to the portable filler of the gravity-bucket conveyor. The bracing of the side walls against outward pressure of the coal, and the supporting of the roof, which is made in two slopes to form a large snow-gutter capable of taking the considerable accumulations often occurring in this district, is combined in one system of framing across the whole section of the coal store. The building is effectively ventilated by means of open dormers arranged in the steeper slopes of the roof. The foundations of the external wall columns and the internal columns are carried on 92 Simplex piles, the pile caps being connected in all directions by light tie-beams



Detail of the West Renewable-Bush Chain and Rollers for Gravity-Bucket Conveyors.

arranged below the level of the floor, clear of any risk of damage due to coal-handling operations.

RETORT HOUSE AND BENCH.

The retort-bench foundations are carried on groups of piles joined together on the producer side by a continuous concrete cap. Running through the whole length of the foundations is the tunnel accommodating the two lines of lip-bucket conveyor which serve for coal and coke handling from the retort-bench. It is built to the full length required to provide for the subsequent extension of the retort-bench to the extent contemplated on this site. The body of the tunnel is constructed in reinforced concrete. The roof in the yard is built of the same material, strong enough to permit the passage of 12 ton motor lorries over it; but in the retort-house it is constructed of steel girders and plates specially designed for feeding and giving access to the conveyors. The design of the whole of the foundations and reinforced concrete work was entrusted to Mr. Burnard Geen, M.Inst.C.E., of Westminster.

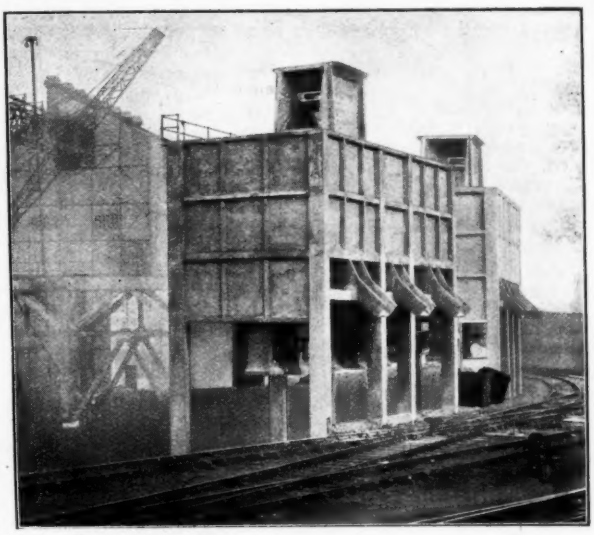
The retort-house is of the usual Glover-West design, consisting of a light steel framework filled in with a good quality red brick 4½ in. thick, with a roof of slates attached to steel angle purlins by aluminium wires. The side of the retort-house adjacent to the coal store is carried upon one wall of the latter. The other three sides are carried upon sill beams in reinforced concrete, 22 ft. span, resting upon piles. The floor of the house is formed of a concrete slab, with a finish of paving bricks laid with the necessary falls and channels for drainage purposes.

The retort-bench contains eight settings (64) Glover-West vertical retorts for continuous carbonization. Each setting contains two units of four retorts each, heated by one producer, provided with one independent chimney with waste-heat boiler, and built quite free from adjacent settings. Each retort also is a

Ferro-Concrete Crane Gantry.

separate unit as regards the coal-feed, coke-discharge, and gas-offtake, and can be adjusted perfectly to the quality of coal under treatment and that of the gas being produced. The retorts are of the standard Glover-West pattern, constructed in silica segmental blocks in the combustion zones with hard fireclay segments at the top and bottom. The retorts and the internal floor tiles and lining of the combustion chambers are of Friden silica manufactured by the Derbyshire Silica Firebrick Company. The retort-settings are designed according to the Glover-West patent system of heating, in which the retorts are surrounded by horizontal chambers the temperatures of which are adjustable throughout the whole length of the retort. This is the essential feature of the Glover-West system, and is particularly valuable when it is desired to make the best use of the practice of steaming the charge during continuous carbonization. Recent improvements—such as the introduction of secondary air midway across the settings, and the use of the internal uptake for waste gases—have been embodied in this design. The producers are of the open step-grate type; and the whole of the control of the setting during operation is centralized in the main chimney dampers, without in any way impairing the full provision of adjustment which is so valuable a feature of the system.

Each setting is provided with a waste-heat boiler capable of generating sufficient steam for a make of upwards of 20,000 c.ft. per ton in the retorts. These boilers are of the water-tube type manufactured by Messrs. Galloways, and are fitted with automatic feed regulators and low-water alarms, so that they require no further operation or inspection than can be readily given by the carbonizing foreman on duty. They will be fed from the water-softening plant installed with the main works boilers. Each boiler is provided with a superheater, so that the retorts will be supplied with steam at a temperature of about 250° C. The



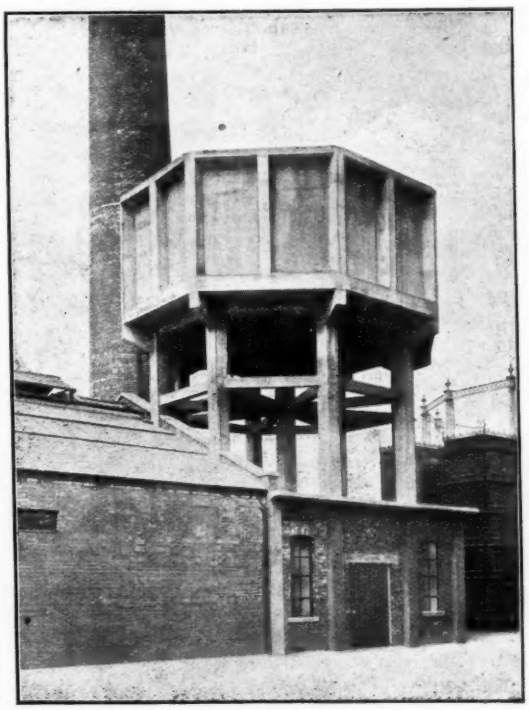
Ferro-Concrete Coke Hoppers.

boilers are operated under natural draught, thus avoiding the noise, cost, and risk of breakdown attendant on the use of fans.

COKE HANDLING PLANT.

Coke from the bottom retort mouthpieces is discharged by way of a light travelling shoot to either of two lines of the recently introduced West lip-bucket conveyor, arranged in a tunnel below the retort-bench; the roof of the tunnel being specially constructed to feed the coke to the buckets without breakage and without overloading. The West lip-bucket conveyor is a development of their well-known gravity-bucket conveyor. The chains are of the renewable-bush type, in which the stamped-steel side links are entirely relieved of all wear and tear; the wearing surface being extended over the full width (6 in.) of the joint pin. The chains themselves are supported on oil-retaining self-lubricating rollers running on steel angle paths braced into rigid frames. The buckets are freely suspended on trunnions projecting from alternate joints of the chain and directly roller-supported. The lip-bucket principle will be readily understood from the accompanying illustration, and it will be seen that this type of conveyor can be fed without any form of mechanical filler whatever—a most valuable feature when dealing with such a material as coke.

The coke is delivered from the conveyor to a receiving hopper at the extension end of the retort-house. From the hopper it passes through a coke-breaker, which can be bye-passed at will, to a West patent automatic skip-filler and to the 1-ton skips



Ferro-Concrete Water Tower.

handled by an electric crane (capable of dealing with loads of 2 tons at 35 ft. radius) manufactured by Messrs. Cowans, Sheldon, & Co., of Carlisle. The overhead return strands of the conveyors are carried by a system of steel lattice girders spanning between the end tower and the retort-house building, at such a height that the future extension of the retort-bench can be erected beneath without interfering with the operation of the existing plant. Coke for the producers and retorts is handled in the same lip-bucket conveyors, and delivered to hoppers suitably disposed in the retort-house so that supplies can be taken to any required point in skips hanging from ball-bearing carriages in runways.

The retort-house machinery and electric crane are driven by electricity obtained from the Corporation.

Reinforced Concrete and Other Work.

Particulars will be found in the Presidential Address of the ferro-concrete crane gantry, coke hoppers, and water tower, of which illustrations are given [p. 101]. The tar and liquor well arrangements have also been sufficiently described; and the same remark applies to the condensing, exhausting, washing, purifying, and other plant.

An Automatic Coke-Quencher.

An automatic coke quencher which is described by Mr. C. R. Henderson, of Ann Arbor (Mich.), consists of a steel overhead tank, into which flows the water used for cooling on the works. A 3-in. pipe from the bottom of the tank runs out over the track which carries the coke-car at the back of the retorts. This pipe passes up into the tank 2 ft., and the top of it is ground off slightly to make a smooth seat. Three guide posts are attached to the top of the pipe, inside of which is a float, made from two tin cans soldered together with a small hole in the top. A ¼-in. rod is fastened to the can, carried to the top of the tank, and attached to an arm. This arm is operated by a piece of wire running over to the motor which works the car. The overflow pipe is passed through the bottom of the tank up to a higher level than the discharge pipe, so that it carries off the surplus water when the sprinkler is not in use. The space between the discharge and overflow pipe contains just enough water to quench a car sufficiently without soaking the material. The sprinkler can be operated from the ground level by just pulling the chain. When the water gets down to the seat of the float, it automatically shuts off. A small vent must be tapped into the pipe just below the float seat, and carried above the water level, otherwise the float will bump up and down when it approaches the seat after the water has been expelled and not shut off. After the float has shut off, the tank fills itself again, and by the time the next lot of coke comes along the sprinkler is again ready to operate.

Association of Engineers-in-Charge.—The Presidential Address for the ensuing session will be delivered at 7.30 this (Wednesday) evening at St. Bride's Institute, Bride Lane, E.C., by Prof. H. S. Hele-Shaw, D.Sc., F.R.S., who will deal with "The Advantages of Incorporation."

Oil Engineering at the Birmingham University.—In connection with the recent developments at the University of Birmingham with regard to oil engineering, to which reference has already been made, it is now announced by the authorities that Sir John Cadman, formerly Head of the Chair of Mining, &c., will continue to act as Honorary Adviser to the University on all mining subjects (coal, oil, and metal), and Dr. Haldane as Director of the Coal Mining Research Laboratories. The new Professor of Oil Mining is Prof. R. R. Thompson, who has held the office of Director of Lands and Mines in Trinidad. Twelve years ago he was a lecturer on Sir John Cadman's staff at the Birmingham University. The new Professor of Coal and Metal Mining is Prof. K. N. Moss, who has filled the post of Assistant Professor at Birmingham University during the past few years.

An Institution of Structural Engineers.—It was decided at a well-attended meeting of the Concrete Institute on Sept. 28, to change the name to the Institution of Structural Engineers, of which there will be a section devoted to concrete constructional work. The idea of thus changing the name was mooted years ago, but left in abeyance. Soon after the Institute was formed, it was realized that the interests involved went much farther than concrete work. Reinforced concrete, in particular, has found an important place in the work the Institute have done, while of later years general constructional work has made vast progress. The result is that the Board of Trade has called the attention of the Council of the Concrete Institute to the fact that they were undertaking work considerably beyond the scope of the original Articles of Association, and have laid it down that they must either alter the title of the Institute or revert to the more limited scope of activities at first contemplated. Hence the proposal to form an Institute of Structural Engineers. The meeting passed a number of resolutions consequential upon the change in name, and all these will be put up for confirmation at an extraordinary general meeting to be held on Oct. 19. Incidentally it may be mentioned that, under the new Articles of Association, there will be an increase of subscription for members and associate members from £2 2s. to £3 3s.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

A visit was made last Saturday by members of the Association and ladies to the Lancaster Gas-Works, of which the President (Mr. G. Dixon, B.Eng., Assoc.M.Inst.C.E.) is Engineer and Manager. The party met at Preston, and proceeded by motor-coach to Lancaster. On arrival at the Engineer's house on the works, the ladies took afternoon tea with Mrs. Dixon.

After the whole party had been photographed, the President offered a few words of welcome, and invited the members to wander over the works, where his staff (Messrs. Knowles, Laytham, Jarmine, and Robinson) would be pleased to answer any questions. Round the works were placed slates having chalked thereon a description of the plant, and various remarks relative thereto. That afternoon they were not (as is usually the case) showing the best features, but the worst ones; and these were being pointed out as lessons to the juniors, and for their educational value. For instance, one slate had written on it: "Valve leaking. Have you to shut-down works for repairs?" Another slate: "Jenkins hot-coke conveyor, speed of conveyor 48 ft. per minute, pusher machine 80 ft. per minute—result unnecessary breaking of coke and overloading of conveyor. This is being altered." Other slates read: "Main flue. Disadvantage, no sight-holes for inspection or means of cleaning." "No. 1 holder. Disadvantage, one common inlet and outlet pipe." "Purifiers. No means of bye-passing." "Furnaces. Too shallow, owing to tidal river coming into the cellar."

LANCASTER GAS-WORKS.

The following is a brief description of the works, the total maximum capacity of which is 1¾ million c.ft. per day.

Coal-Gas Plant.—Horizontal retort-house—thirteen beds and eight retorts, each 23 in. by 16 in. by 20 ft. through. Total capacity, 1¼ millions per day. Complete with coal handling, breaking, elevating, and conveying plant, overhead hoppers, De Brouwer charging machine, Jenkins pusher and hot-coke conveyor. The plant is provided with the usual condensers, exhausters, scrubbers, purifiers, and meter. The coke is quenched, elevated, and screened into bunkers, from which it is loaded direct into railway wagons or motors for local sale.

Power-House.—Three gas-engine driven electric generators of a total capacity of 80 B.H.P.

Water-Gas Plant.—One set of Humphreys and Glasgow carburetted water-gas plant of a capacity of 500,000 c.ft. per day. This plant is a complete unit, having its own exhauster, washers, holder, and meter.

Holders.—There are two column-guided holders of a total storage capacity of 1½ million c.ft. per day.

Chemical Plant.—Four ton per day continuous Wilton sulphate plant, complete with whizzer and dryer. Tar distillation plant, consisting of two pot stills (total capacity 25 tons), with condensers, storage tanks, crystallizing pans, and pitch bay. A small rectified benzole plant, capacity 40 gallons per day.

Oxide Disintegration.—A portable oxide disintegrator running on rails is installed in the revivifying shed. This is direct electric-motor driven from plugs along the wall, fed from the generating house.

High-Pressure Compressing Plant.—Two Bryan Donkin horizontal steam compressors of 20,000 c.ft. per hour each, and receiver. This plant feeds round the district, joining into the low-pressure mains in three places, through Reynolds governors, so as to maintain the pressure at those points.

Boilers.—There are two Lancashire boilers supplying the works, pumps, fitting shops, and tar plant; one supplying the sulphate plant; and one the C.W.G. plant. Four boilers in all.

Offices.—There are the usual offices, laboratory, mess-rooms, stores, repair shops, and engineer's workshops.

Showrooms and Distribution Shops.—These are situated in the centre of the town, in Market Square.

After the tour of the works, the party were driven to Market Square to visit the showrooms, which are in charge of Mr. R. Smith. The showrooms are very up-to-date, and well worthy of the town. Then the members went round the castle grounds, and thence to the Storey Institute for tea. They were there joined by the ladies, who had returned from Morecambe, whither they had been under the guidance of Mrs. Dixon.

The Mayor (Councillor J. Nuttall, J.P.) thanked Mr. Dixon for inviting him to be present, and extended to the Association a hearty welcome on behalf of the Corporation to their gas-works and the good old town of Lancaster. He was sure that these visits were helpful, and must improve their knowledge. He was glad to see the ladies there that afternoon, even if they were not studying gas matters.

Mr. J. Alsop (Bolton) moved a vote of thanks to the President for his kindness and hospitality to the members. He said the outing had been a pleasant one, and the works had proved of great interest. The President was a man of original ideas, and not afraid to carry them out. That afternoon they had seen not the best side of things, but actually the worst. In fact, these latter had been shown up. The usual procedure was to show the successes and keep the failures dark, but Mr. Dixon had set-out to make the visit of great educational value, and it was to be hoped that other engineers would follow suit. Mr. Dixon came to Lancaster just over three years ago, and during this time the whole of the works

had been reorganized. Showrooms had been opened, and had proved a success. The works plant was in a better state of efficiency than it had been for many years. Mr. Dixon worked well with his staff, and when this was the case the undertaking was bound to prosper. The works at Lancaster were in a very sound financial position; and with Mr. Dixon as Engineer, this was not to be wondered at.

Mr. E. CROWTHER (Wallasey), in seconding, said he was a personal friend of the President, and could say from actual experience that Mr. Dixon was a sound and practical Engineer. He had followed him at the works the President had left, and had found no loose ends to tie up. He had been able to commence his duties just where Mr. Dixon had left off—so well arranged and so thorough had been the work of his predecessor.

Mr. DIXON said, in reply, that the fact that a party of a hundred had turned-up was in itself sufficient reward. Mrs. Dixon had been particularly pleased to see the ladies, and to have the honour of entertaining them.

PRESENTATION TO THE PRESIDENT.

The HON. SECRETARY (Mr. J. Alsop) called upon Mr. E. Parker, of Altrincham, to hand to the President a gold-plated silver medal, which Mr. Parker had presented to the Association for the President and his successors.

Mr. PARKER, in a neat speech, told his audience how much he appreciated his connection with them. He was a member at the invitation of the President, and had spent many happy days with them; and he wished to show to the Association and its Presidents how much he valued their kindness to him.

Mr. DIXON accepted the medal on behalf of the Association, and said he would be proud to wear it as a mark of appreciation. He was of opinion that it would help to add dignity to the office of President, and anything that aimed at this was to be desired. He was proud to think he was the first President to hold the medal during his year of office.

The medal has a beautiful enamelled centre, showing a large up-to-date gasholder, with the name of the Association round the outer edge, and the words "President, 1922." On the reverse side are the names of the donor and the President, and space for future holders of the office.

Mr. DIXON then read his

PRESIDENTIAL ADDRESS.

"O wad some power the giftie gie us
To see oursels as others see us."

Probably to no one could the attainment of the wish expressed by the immortal Scottish poet be of more value than to the junior gas engineer to-day; and I may, therefore, be excused if I attempt a criticism of ourselves in the hope of benefiting those whom the cap fits.

During the past few years circumstances have brought about almost revolutionary changes in our profession, particularly in the methods of carbonization and gas supply; and the junior who has had the opportunity of the practical detail work entailed in these changes should not only realize his luck, but must, if he wishes to succeed, be alert enough to take full advantage of that opportunity.

For some years I have been a junior, and have noted with great interest the work and the prospects of the younger members of our profession. After further observations, as the result of passing through the ordinary and office-bearing stages of this Association, I have formed opinions of strengths and weaknesses which, summarized, I thought might prove of benefit.

EDUCATION.

It is, I think, generally admitted that the standard of scientific and technical knowledge required in the profession to-day makes it imperative that the class of man attracted to its ranks must be improved. It is to be hoped, therefore, that the education scheme under consideration by the Institution of Gas Engineers and the Board of Education will be hastened forward, and eagerly supported by all concerned.

I am of the opinion that juniors entering the profession should serve their practical workshop period first, to be followed by an approved course of technical training; otherwise there is a tendency to skip the practical side altogether or to enter it too far advanced (say, with time for only a few months in each department).

I always look back upon the first few months of my own practical apprenticeship—boiling tea cans, wheeling handcarts, running messages (often to stores for things that never existed), &c.—as being the most valuable, giving, as it did, the correct "atmosphere" for admittance to friendly relationships with fellow-workmen.

TECHNICAL TRAINING.

A technical course is essential if a junior has ambition to rise to any height. One of the most noticeable wants to-day is ability to express oneself clearly in words or to set-out figures intelligently. I have met several juniors who knew their work well, but who have failed to attract attention solely on account of this lack of technical education.

This was very pointedly brought home to me recently, when reading over some applications for a technical position. Only a few men had any idea of writing an application that would be singled out from among the number for further consideration, although in several cases it appeared that there might be latent worth—if only the application had been properly expressed. The two men who wrote the best English composition, and stood clear with regard to technical training, were foreigners! This fact made such an impression upon me that I sought out the two men and had long conversations with them, from which I learned of their almost compulsory technical training from a very early age in their own country.

Let it not be thought that I have any wish to decry the English junior; but it is well to bear such cases in mind, as it is also well to notice that these foreigners knew the value of coming to England to complete their training, so that they might be *au fait* with the best practice of this country.

May I emphasize to the juniors this question of the composition of applications? It is the bottom rungs of the ladder that are the hardest and most crowded, and every effort must be put forward by individual members to frame carefully applications that will attract employers, and so enable them to get into the rarer atmosphere of the higher rungs. There are far too many applications sent in carelessly as a sort of lottery. These are not only a waste of time, but, by reason of their half-heartedness and careless composition and finish, are a discredit to the juniors as a whole.

It is fair to mention here that the fault is not entirely with the applicants. There are many cases where positions are advertised in a very broad manner, not specifying exactly the type of man required or the remuneration to be paid, though both duties and salary have been previously fixed in the mind of the employer who is advertising. Juniors go to trouble and often considerable expense in sending in applications, which (not coming within the desired limits of the employer) are never even considered. This is a type of case which becomes very disheartening to applicants, and is one which, by a suitable letter pointing out the facts to advertisers, might be taken up by a properly organized representative body in the industry.

It is often argued that a young man cannot afford the time for full practical, theoretical, and specialized training; but it is overlooked that a thorough grounding makes future work hundreds per cent. quicker to grasp, and the earlier time spent is thus quickly compensated.

OPPORTUNITIES OF JUNIORS ON WORKS.

It is the duty of every junior to look after himself. Far too many wander about the works, conscientiously enough, appearing busy, but doing nothing in particular, waiting—sometimes a very long time—to be set a particular job by their superiors. Without any disrespect, may I say that superiors are often somewhat at fault in this respect, where, with all good faith, they allow their pupils or juniors to have free access to any parts of the works without setting them any defined duty and inspecting the work upon completion.

A junior may "look at" retort-house work, purification, storage, distribution system, and so on, with the regularity of clockwork, day in and day out without having his attention attracted particularly to anything, and consequently not learning anything except how comfortable the work is when everything is going on correctly. He should leave well alone, and concentrate upon things that go wrong and their remedies.

If everything is straightforward, let the junior note some particular piece of plant—study it in the being, from text books, from plans, draw sketches of it, watch its daily life, and become really acquainted with all its details. Having mastered that, let him pass on to the next piece of plant and do the same with it, till he has been through the works. As an instance, let him study each brick and retort as built into the setting, let him daily watch the setting at work, noting any weaknesses, and finally let him see the same bed pulled down after its life is done, and note the shapes, sizes, and conditions of all the bricks and retorts he saw put in when new. There is endless valuable information to be gained in this way upon what is probably the most interesting and pressing of all gas-works carbonizing problems to-day.

To bring this work to a satisfactory conclusion, let him make copious notes upon all he has observed, and publish them for the benefit of other juniors who are perhaps battling with problems which would be solved by the communication of such results.

I believe we juniors very often belittle our own findings, thinking that they are not of interest because previous authors have written upon the same subject. We are apt to forget that there is very little new under the sun, and that many will read our notes who have forgotten or missed the earlier publication upon the same subject.

The same remarks apply equally to the distribution side of the profession. In direct proportion to the scientific advance of gas-manufacturing processes, we have the increase in the number of uses to which the consumer requires gas to be put; and the problems in high and low pressure main-laying, boosting, governing, furnace work, engine uses, and the like, are all examples upon which the junior should apply himself at every opportunity.

The problems met with both on and off the works are, of course, legion. It is not within the scope of these notes to deal with more—satisfaction will be amply secured if I have whetted the curiosity and determination of the junior, and made him see he has set work laid down for himself, from which he can improve his own experience and be of service to his superior. I would commend to the notice of all members the value of working and setting-out thermal efficiency or other tests of boilers, retort-settings, or other plant. Such tests, besides being of absorbing

interest to the technical men carrying them out, are of the highest value to juniors or employers, if set-out properly and the correct deductions made from the resulting figures.

From casual conversations with juniors, there appears to be a great number who do not even know the definition of such simple terms as "thermal balance," &c., and consequently they are unable to follow the most excellently set-out findings of such bodies as the Fuel Research Board.

VALUE OF MEMBERSHIP OF THE JUNIOR GAS ASSOCIATIONS.

There are many juniors who do not appreciate the value of the Junior Gas Association; and I appeal to all to support it in every way possible, for their own good. Quite apart from the social side and the technical value of the visits and papers, there is another benefit very often not realized. Those behind the scenes on the administrative side of the Association will testify to the careful watch that is kept upon members for promising juniors for future office-bearers, and often for recommendation for promotion in their profession quite apart from the Association. Many appointments to good positions are gained directly or indirectly through the recommendation of the senior members of your junior association, such recommendation being generally based upon the personal impression made as a member.

It is exceedingly important, therefore, that every junior should not only join the Association, but should take part in the visits and discussions, in order that he may obtain this benefit

EXPENSES OF MEMBERS AT MEETINGS.

One of the great drawbacks to the Association is that junior members find it difficult to pay the heavy expenses incurred in attending visits or meetings. Ever since I first joined the Council of this Association, I have advocated that some scheme should be formulated to surmount this difficulty, which has become more and more real during the past few years, as travelling and other expenses have risen beyond all expectation. This matter I see has been recently taken up officially by the Yorkshire juniors; and I am hopeful that they will be warmly supported, and that a decision will be come to in the near future.

Active support of the Association from the beginning of apprenticeship onward is undoubtedly a vital necessity to every junior; and I believe both corporations and private companies would lend a very sympathetic ear to an appeal that part or all expenses should be paid. The question is not, of course, as straightforward as it appears at first sight, as some proof of value would probably have to be given. It does, however, appear that upon recommendation of the chief engineer, or a satisfactory written account of the visit or other proof being given, some measure of financial assistance might be agreed upon.

REMUNERATION OF JUNIORS.

My criticisms would not be complete without some reference to this complex and difficult question, and some appreciation of the work of the National Association of Technical Gas Officials in this connection. That there is a need for some organization of the kind, to look after the interests of members, I do not think can be doubted; and as one who has seen something of the inner workings and the amount of correspondence asking for advice or assistance and giving cases of real hardship, I can testify to the genuine effort made by the officials in the face of overwhelming financial and other difficulties.

Personally, however, I have always held the view that no fixed scale of remuneration is possible for juniors—even as a guide—because the technical qualifications and abilities of men with the same "title" in different works are so widely different. I am firmly convinced that the education scheme will ultimately provide the solution to this problem; but it will take time, and the present outlook is not encouraging. Better class men must be attracted before larger salaries can be commanded; and, on the other hand, better class men will not be attracted till larger salaries are offered—a veritable *impasse!*

THE JUNIOR GAS ASSOCIATIONS.

From small beginnings the junior gas associations have now a recognized position in the ranks of the industry; and to keep them efficient, it is well to review occasionally their position in the light of continually altering conditions.

TITLE.

Many criticisms have been offered with regard to the suitability of the existing title of the Association—chiefly centreing around the word "Junior." From a glance round the members present at the majority of our visits and meetings, this word "Junior" appears a misnomer. I think, however, the question should be considered from an entirely different standpoint. Is the apparent misnomer not really due to the fact that the "young juniors," in whose interests the Association was formed, do not attend, either because they are not sufficiently interested in their own welfare or because they are not in a position to pay the necessary expenses to meetings? Whatever may be the cause, I am of the opinion that most true juniors neglect this very necessary duty to themselves till far too late, and are very often in a sort of transitory stage between junior and senior before they throw in their lot with the Association.

Having joined, they become keen supporters, and although eligible for, and often members of, the senior Association, they retain their junior membership, and lend their very much appreciated support by attending the meetings and helping with their criticisms and experience. The encouragement given to us by the continued support of these "senior" friends cannot be overestimated; and I would take this opportunity of recording our gratitude.

If this surmise is correct, it would appear that the aim of the association should be to do all in its power to encourage the "junior juniors" to join and take part in the activities. This satisfactorily done, the word "junior" would no longer seem out of place, and could be retained.

I have found but one disadvantage in the use of the term, and that is that when approaching firms outside the industry for permission to visit works, &c., we are apt to be underestimated and looked upon as a purely student body.

WORK OF THE JUNIOR GAS ASSOCIATION.

The administrative work, and the participation in the speeches or discussions after visits or papers, is left in the hands of far too few; and careful thought should be given as to the adoption of a new policy to encourage younger members to come forward and take their share of the work. Progress in this direction has, I believe, been made in some districts by making the meetings purely informal, and the topics for discussion more practical and less theoretical.

Short notes should be substituted for long papers; and these might resolve themselves simply into the description of problems or difficulties met in daily practice, and their remedies. How much valuable information would be gained if members would describe their failures in detail, and let others profit by them. Visits to works, too, would be of very much more lasting value if steps were taken to demonstrate carefully all failures, paying little more than passing attention to the other parts of the plant.

I believe that the Association should act as a sort of information bureau for the district, where members could submit difficulties or questions. Such problems could be answered by a small committee sitting periodically, or, in the event of no solution being forthcoming, could be submitted to plant makers or other bodies concerned, who would doubtless be only too glad to give assistance through a recognized body such as ours. Interesting problems and solutions would then come to the knowledge of the Council, who could record them and, as desirable, publish them for the general information of members.

I would also welcome the day when employers requiring assistants would apply to the Association for the recommendation of suitable members or for information regarding applicants. In this way the sphere of usefulness would be widened; and the inducement to all juniors to join the Association would be greatly strengthened.

The number of meetings is at present too few, and the area covered by our particular branch too large. It is desirable to consider the question of forming sub-sections, each of which could hold more frequent informal talks with the members in its own immediate district, besides attending the full monthly meetings as at present. There appears ample room in our district for sub-sections—say, at Manchester, Liverpool, Wirral, Blackburn, Preston, &c.

If this scheme were adopted, it would also do away with what I think is at present a necessary evil—that of crowding too much into one meeting. There is a common practice of visiting a works or factory in the afternoon, and then having a paper read by one of our members upon some gas manufacture or distribution topic totally irrelevant to the subject of the visit in the afternoon. But, with a view to improving upon this, we have this year endeavoured to follow the visit by a paper or notes read by some technical member of the firm whose works we visited, dealing with their works or product from their point of view; and then we discuss the question from the gas profession side. This it is hoped will help us to get the best results out of a visit, and to impress any points of interest upon the mind.

It is, of course, impossible for our Association to arrange visits to all works where interesting new work is being carried out; but it does occur to me that great benefit would accrue if the junior members at the works where any new work was being carried out, either constructional or technical, would report it in the form of "notes" to the Council of this Association, who could record it and follow it up. When sufficient cases of general interest were obtained, they could be communicated in detail to members at a meeting specially called for the purpose.

There are many clever devices worked-out and put into operation at various works which would be of the greatest possible interest and use to members, but which, from modesty or other cause, are never published. It should be part of the duty of juniors to report these to their Association, so that fellow members may benefit.

CONCLUSION.

May I, in conclusion, trust that these notes will be accepted in the spirit in which they are offered—from one junior to fellow juniors—in the hope that the younger men entering the profession may be encouraged to avoid the faults others have made, and that the Junior Associations may look to see if, by any means, they can modify their methods and policy to keep abreast of the changing times, and be of more service to their members and to the industry as a whole.

May I also, gentlemen, record my warm thanks for the honour you have done me by entrusting me with the office of President of this Association this year? I have realized one of my earliest

ambitions, and it is with difficulty that I find words to express my pride at attending our meetings as President of the Manchester and District Junior Gas Association.

Mr. G. HAYNES (Liverpool) moved a vote of thanks to the President for his address, and said he had listened to it with great pleasure. The subject-matter came as a surprise, and was quite original. It was evidently the intention of the President to benefit all who were not as advanced in the profession as the author of the address. How often did one find a very different spirit shown by those who had risen towards those who were below them. But here their President was looking back, and anxiously holding out his hand to those who had not risen as he had. He seemed to be out to help those members who would show that they were keen to improve themselves.

Mr. A. L. HOLTON, who seconded, recalled the fact that the President had risen from a junior position to that of a chief engineer. They had never had a Presidential Address on the lines of this one.

The statements of accounts of the Association were presented and passed earlier in the proceedings.

LOW-TEMPERATURE CARBONIZATION AND THE THERM.

By WALTER CHANEY.

The experiences gained during the war by the gas industry in producing oil, benzole, and explosives were of the greatest national importance, and they also established the fact that the cubic foot did not represent the value of the gas to the consumer. Gas-works are classed as public utility undertakings, and certain privileges as such, accompanied by statutory obligations, are allotted to them by Parliament. From time to time these statutory obligations are reviewed, to ascertain whether they correspond in the best way to the demands of the public. Such a review occurred in 1920, embracing the selling basis of supplying gas; and the Royal Assent was given to the Gas Regulation Act introducing the therm.

During the period of the war the Government partly withdrew the obligations placed upon gas undertakings, and requested them to carbonize the coal at a lower temperature. It was this action that probably brought home to the gas industry and to the consumers that the cubic foot was not an equitable selling standard. The substitution of the therm for the cubic foot substantially alters the aspect of gas manufacture, and enlarges the area of our consideration of carbonization systems, bringing into focus the concentration of the therms contained in a cubic foot of gas. To illustrate this extended view—

Producer gas is probably the lowest grade of gas, but the cheapest form of heat energy. From a ton of coal, 130,000 c.ft. of 130 B.Th.U. gas may be obtained under ammonia recovery conditions, equivalent to 169 therms per ton of coal gasified. The manufacturing cost of this gas at the present time is about 3d. per per 1000 c.ft., or 2·3d. per therm. This low-grade gas may be enriched, to form a town supply of 500 B.Th.U. declared value, by the addition of the gas from low-temperature carbonization, thus:

57·5 p.ct. of 130 B.Th.U. producer gas at 2·3d. per therm	= 1·32d.
42·5 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 1·70d.
Town gas of 500 B.Th.U. declared value	= 3·02d. per therm.

NOTE.—Producer gas having a calorific value of 150 B.Th.U. may be made under non-recovery conditions, the approximate analysis of the gas being:

CO_2	17·4 p.ct.
CO	10·3 ,,
H	25·5 ,,
CH_4	3·2 ,,
N	43·7 ,,

The next step in calorific progression is that of blue water gas having a calorific value of about 300 B.Th.U. per cubic foot. From a ton of coke, about 52,000 c.ft. of 300 B.Th.U. gas is obtained, equivalent to 156 therms per ton of coke gasified; the manufacturing cost of the blue water gas being about 4d. per therm.

71·4 p.ct. of 300 B.Th.U. blue water gas at 4d. per therm	= 2·86d.
28·6 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 1·14d.
Town gas of 500 B.Th. U. declared value	= 4·00d. per therm.

Then follows the gas obtained by steaming in vertical retorts (Sir George Beilby, "Transactions of the Institution of Gas Engineers," 1920-21). Yield of gas—25,610 c.ft. of 432 B.Th.U. per ton of coal carbonized, equivalent to 110·6 therms per ton. Manufacturing cost (say) 5d. per therm.

88 p.ct. of 432 B.Th.U. coal gas at 5d. per therm	= 4·40d.
12 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·48d.
Town gas of 500 B.Th.U. declared value	= 4·88d. per therm.

We come now to the ordinary process of gas manufacture, whereby 14,000 c.ft. of 480 B.Th.U. gas is obtained, equivalent to 67 therms per ton of coal carbonized; costs of coal gas varying from 10d. to 5d. per therm.

Coal Gas at 10d. per Therm.

53 p.ct. of 480 B.Th.U. coal gas at 10d. per therm	= 5·3d.
32 p.ct. of 300 B.Th.U. water gas at 4d. per therm	= 1·3d.
15 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·6d.
Town gas of 500 B.Th.U. declared value	= 7·2d. per therm.

Original cost 10d., combination 7·2d., saving 2·8d. per therm.

Coal Gas at 9d. per Therm.

53 p.ct. of 480 B.Th.U. coal gas at 9d. per therm	= 4·77d.
32 p.ct. of 300 B.Th.U. blue water gas at 4d. per therm	= 1·28d.
15 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·60d.
Town gas of 500 B.Th.U. declared value	= 6·65d. per therm.

Original cost 9d., combination 6·65d., saving 2·35d. per therm.

Coal Gas at 8d. per Therm.

53 p.ct. of 480 B.Th.U. coal gas at 8d. per therm	= 4·24d.
32 p.ct. of 300 B.Th.U. blue gas at 4d. per therm	= 1·28d.
15 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·60d.
Town gas of 500 B.Th.U. declared value	= 6·12d. per therm.

Original cost 8d., combination 6·12d., saving 1·88d. per therm.

Coal Gas at 7d. per Therm.

53 p.ct. of 480 B.Th.U. coal gas at 7d. per therm	= 3·71d.
32 p.ct. of 300 B.Th.U. blue water gas at 4d. per therm	= 1·28d.
15 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·60d.
Town gas of 500 B.Th.U. declared value	= 5·59d. per therm.

Original cost 7d., combination 5·59d., saving 1·41d. per therm.

Coal Gas at 6d. per Therm.

53 p.ct. of 480 B.Th.U. coal gas at 6d. per therm	= 3·18d.
32 p.ct. of 300 B.Th.U. blue water gas at 4d. per therm	= 1·28d.
15 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·60d.
Town gas of 500 B.Th.U. declared value	= 5·06d. per therm.

Original cost 6d., combination 5·06d., saving 0·94d. per therm.

Coal Gas at 5d. per Therm.

53 p.ct. of 480 B.Th.U. coal gas at 5d. per therm	= 2·65d.
32 p.ct. of 300 B.Th.U. blue water gas at 4d. per therm	= 1·28d.
15 p.ct. of 1000 B.Th.U. low-temperature gas at 4d. per therm	= 0·60d.
Town gas of 500 B.Th.U. declared value	= 4·53d. per therm.

Original cost 5d., combination 4·53d., saving 0·47d. per therm.

A saving of 1d. per therm at 67 therms to the ton = 5s. 7d. per ton of coal carbonized.

To obtain a straight town gas of 500 B.Th.U. declared value, it would be necessary to reduce the make per ton from 14,000 c.ft. of 480 B.Th.U. to 13,420 c.ft. of 500 B.Th.U. gas. This reduction would not materially alter the original cost of manufacture. The controlling influence of the high calorific low-temperature gas not only enables large quantities of blue water gas to be added to the already defaulting supply, but at the same time reduces the manufacturing cost of the town's gas.

Southern Association of Gas Engineers and Managers (Eastern District).—The next meeting of the Eastern District Section of the Association will take place at 2.30 p.m. on Oct. 24, at the Institution of Gas Engineers, No. 28, Grosvenor Gardens, S.W.

"B.C.G.A." Service Folders.—Service Folder No. 3 of the British Commercial Gas Association deals with the important subject of "Sustaining and Developing the Lighting Load." The Association have also prepared a memorandum on "Lighting Maintenance," a synopsis of which is included in the folder. Apart from this, there are samples in the folder of excellent literature, which should make a strong appeal to consumers, and a number of suggestions for local advertising and for showroom display. The drafts of circular letters will be very helpful.

Eastern Counties Gas Managers' Association.—The half-yearly meeting of the Association will, as already announced, be held at Norwich on Thursday, Oct. 19. The proceedings will commence at 11 a.m., at the Bishop Bridge Works of the British Gas Light Company, to be followed by an inspection of the St. Martin-at-Palace Works, where important and interesting extensions have recently been completed. On the invitation of the Chairman and Directors of the Company, there will be luncheon at the Royal Hotel, and this will be followed by the business meeting at the Maid's Head Hotel—the retiring President (Mr. H. G. Ruggles, of Leighton Buzzard) taking the chair at 3 o'clock. After the formal business, and the induction of the new President (Mr. T. F. Canning, of Southend-on-Sea), there will be a lecture by Mr. Thomas Glover, C.B.E., M.Inst.C.E., on "Gas-Works Reconstruction at Norwich," illustrated by drawings and lantern slides; and this will be discussed. Tea will be served at the conclusion of the meeting.

THE CERAMIC SOCIETY.

Refractory Materials Section.

The Eleventh Meeting of the Refractory Materials Section of the Ceramic Society took place at the Chamber of Commerce, New Street, Birmingham, on Oct. 3 and 4. Lieut.-Col. C. W. Thomas occupied the chair, and was supported by a good muster of members. With the exception of a paper by Mr. G. W. Hefford (of the Board of Education) on "Technical Education in the Refractories Industry," the whole of Tuesday morning was occupied by an important discussion on "Bricks for Coke-Ovens."

Silica Bricks for Coke-Ovens.

This was opened by a paper by Mr. A. H. MIDDLETON, entitled "Silica Brick for Coke-Ovens," which, in the absence of the author, was read by Mr. E. M. Myers (President of the Coke-Oven Managers' Association). Mr. Middleton defined silica brick as a brick made from quartzite or ganister containing about 97 p.ct. silica, with no addition but the necessary fluxing or bonding material. The composite brick almost universally used in this country for coke-oven walls, containing 77 to 85 p.ct. silica, he calls quartzite brick, in accordance with American usage. As regards this country, the author advocates the consideration of silica bricks for use in oven walls in substitution for quartzite bricks in every case where salty coal is in use, and also in other instances, except for patching and repairing existing quartzite walls. The advantages claimed for the use of silica bricks instead of quartzite for coke-oven walls include: (1) Greater output and greater thermal efficiency; (2) greater durability under ordinary conditions; (3) resistance to corrosion where salty coal is used; (4) the possibility of varying the heat treatment where different classes of coal have to be employed. Numerical data relating to certain American coke-oven plants are cited in support of these claims.

The greater output for a coke-oven of given size constructed of silica bricks is attributed mainly to the higher working temperatures, but partly also to the greater thermal conductivity of silica bricks at the higher temperatures. Results obtained by the author during a visit to America last year showed that, with an increase in temperature of 200° C., the carbonizing time was reduced 8½ hours (from 24 to 15½). Figures quoted from German practice with coke-ovens built of silica bricks lead to conclusions of a similar nature. It is further claimed that the yields of by-products are generally as high as would be obtained under English conditions with similar classes of coal.

The life of coke-oven walls rarely exceeds three years, and is sometimes no more than nine months, in districts where salty coal is used. At one British plant, a silica-brick battery of coke-ovens lasted six years, whereas a similar quartzite battery close to it only ran three to nine months before the walls had to be rebuilt. Other experiences at the same works are quoted, and also similar results obtained in Germany. The extra cost of silica bricks is practically balanced by the greater output possible from the ovens. The permanent expansion of silica bricks should give little trouble at temperatures at which coke-ovens are usually operated in England; but for use when working 250° to 300° C. higher, the bricks should show low permanent expansion. No serious trouble need arise in this direction, if the bricks are properly burned, and if the oven is designed to make allowance for unavoidable expansion.

The peculiarities shown in the expansion of silica owing to conversion of quartz into cristobalite or tridymite, or the change of one variety into another of any of these three main forms of crystalline silica, are considered in some detail, with special reference to the accompanying changes of volume. In silica brick making the conversion of quartz (the high specific gravity form of crystalline silica) into a low specific gravity form, cristobalite or tridymite, takes place very slowly below 1350° C., but quickly at 1500° C. in many cases. Badly burned silica bricks consist almost entirely of quartz. Ordinary well-burned commercial silica bricks contain a large amount of cristobalite. Tridymite has the least thermal expansion, and is least liable to large and sudden increases of volume. Silica bricks can be burned in the kiln so as to form a large amount of tridymite, but it is commercially impracticable to make an all-tridymite brick. The author fired three lots of the same batch of silica bricks in different parts of a kiln at actual temperatures of 1380°, 1433°, and 1530° C. respectively; and the corresponding specific gravities of the bricks were found to be 2·43, 2·35, and 2·28—the last being nearly the same as for tridymite. The specific gravity determination is a ready means of gauging the degree of firing. Coke-oven walls made of bricks like those just referred to, would show great differences in permanent expansion, if worked at temperatures such as are general in America.

Mr. T. BIDDULPH SMITH agreed that, with very salty coal, there was less corrosion of silica bricks than of quartzite bricks. The rate of carbonization of the coke would depend less upon the conductivity of the refractory than upon that of the coke made in the charge. He considered the greater output of the American ovens to be largely due to the use of dry coal.

Mr. W. J. REES objected to the use of the term quartzite brick, as introducing confusion. It would be better to avoid it, and to conform to the custom in this country of regarding as silica bricks such as contain over 92 p.ct. of silica, and terming "semi-silica" or "clay silica" bricks those which fall in between these and the true firebricks made of fireclay. Higher thermal conductivity of silica will certainly count in the carbonization of coal. In silica bricks, expansions are inevitable but can be controlled. The specific gravity test should be used only for comparing bricks with about the same lime content. The texture of the bricks is much more important in coke-oven practice than in metallurgical practice. They should be close grained. Ammonium chloride is the culprit in attack by salty coals. It is possible to find in the bricks ammonia aluminasilicates, and the break-down of these causes surface defects. Ferric chloride also aids in the attack. Sillimanite in bricks strengthens resistance. Even with non-salty coals, the use of silica bricks might well be considered. They have greater strength, and coke-ovens built with them have very long lives.

Mr. H. JOHNSON did not consider there was sufficient reason to discard the bricks now used in this country in favour of silica bricks.

Mr. J. W. LEE said it was necessary to attempt to produce a silica brick to stand coking practice. Silica bricks in America are made in a different way from the method adopted here, and the Americans generally coke dry coal. Silica bricks in this country are unreliable in practice, being too variable. When bricks of uniform composition and expansion are available, better results will be obtained.

Dr. A. SCOTT pointed out that Mr. Middleton had not referred to the possibility of spalling, or to abrasion, to which silica bricks are subject at high temperatures.

Mr. G. W. J. BRADLEY, speaking as a user of bricks, could not accept the suggestion that increased output can be due wholly to increased conductivity of the silica bricks, but thought increased radiation was probably effective for carbonization. Stourbridge bricks have given something like forty years' service.

Mr. G. M. GILL mentioned that quite a small increase in temperature gives a big increase of gas output.

Mr. E. M. MYERS stated that in America they have definitely proved that, by varying the heat treatment, they can get what they want. Different coals require different heat treatments and appropriate refractories. The compression of coal is not practised in America. By increasing the temperature, all the disadvantages of compression can be obviated. In the use of silica bricks for carbonizing, whether with retorts or coke-ovens, the temperature should be kept nearly constant—otherwise there is danger of wide variation. Bricks of good shape are needed, and leakage should be reduced to a minimum.

New Forms of Kilns.

The first paper on Tuesday afternoon was by Sir ARTHUR DUCKHAM, on "Some New Forms of Kilns." A continuous kiln erected in the Stourbridge district just before 1914 consisted of sixteen chambers, each about 19 ft. wide, 16¾ ft. long, and 6 ft. high to the springing of the arch, arranged in two rows side by side. There were four fireholes and bags to each chamber, and the firing was semi-gaseous. This firing arrangement with four bags and down draught gives excellent results with firebricks made of local clay, with clay grog and silica. The temperature was raised until Cone 13 collapsed in the centre of the material, and this temperature was held for about twelve hours. Each chamber holds 60 tons of material, and fourteen or fifteen chambers per month are burned, the fuel consumed being 20 to 25 tons of coal per 100 tons of material. Two chambers ahead of the firing chamber and two chambers behind were worked with it. The gases entering the chimney (which was 180 ft. high) were only at 120° Fahr., so artificial draught had to be substituted for natural draught, in order to ensure satisfactory results under all conditions. The change resulted in greater output and proper burning.

A kiln called the "W.D. Central Bag Kiln" has the advantages of even heating; that the bag is not a part of the kiln itself, and so can be made of different material and easily renewed; that proper combustion of the heating gases is assured; and that the kiln proper is never exposed to the direct action of the heating gases during combustion. A single chamber of this type, with an outside producer burning coal, gave satisfactory results. A continuous chamber kiln on the same lines is to be erected shortly.

Tunnel kilns, while economizing labour and fuel, and giving even heating and cooling of the materials, have as disadvantages certain mechanical difficulties, and a tendency to uneven burning. In an open tunnel kiln these difficulties have been in great measure overcome by providing cross walls (which register with offsets on the kiln walls) on each truck, the gases being forced along a zigzag path. The length of the kiln can thus be reduced from 300 to 130 ft. Other special contrivances facilitate even heating and proper cooling.

An annular tunnel kiln was designed for firing large glazed goods slowly and evenly, followed by slow and even cooling. The continuity of the tunnel was broken at the unloading and loading point, but the annular firebrick tray carrying the material is continuous and unbroken. The kiln is heated by means of producer gas burned in six separate horizontal flues situated one above another in the side walls of the tunnel. Mechanical draught is provided, by means of a fan and motor. The chief advantages of this type of kiln are convenience of working, elimination of trucks, even heating, and economy of fuel. Structural details were in each case shown by means of lantern slides.

Grading of Silica Bricks.

The next paper was by Mr. P. B. ROBINSON, M.Met., and Mr. W. J. REES, B.Sc., F.I.C., on "The Grading of Silica Bricks."

Grade analyses of green bricks were correlated with the properties of the corresponding burned bricks. Generally about 40 p.ct. of the green brick material remained on a 30-mesh (to the inch) sieve, and about 40 p.ct. passed through a 100-mesh sieve. Grading curves showed that with the ordinary pan-mill crushing it was impossible to get enough fine material to give a brick of appreciably less porosity than those at present made, as longer grinding only led to the production—in the various ganisters examined—of material of about 100 mesh (0·2 to 0·3 mm.); and it was shown that for the production of a dense brick, fine-ground material from a ball mill must be added. The authors concluded that for a mechanically strong brick—(*a*) a hard rock crushing into very angular fragments is necessary; (*b*) the best size for the largest pieces in the brick is 6·7 mm., these larger angular pieces imparting strength to the brick at both high and low temperatures; (*c*) at least 40 p.ct. of fine-ground material passing a 100-mesh sieve is necessary, and for a dense brick (of less than about 27 p.ct. porosity) the addition of fine-ground material from a ball mill must be made; (*d*) the bricks must be well burned to give low bulk density and low power density, with appreciable increase in strength, thus increasing resistance to internal strains, and so reducing the tendency to spall.

Behaviour of Fireclays, Bauxites, &c., on Heating.

On Wednesday morning, Mr. H. S. Houldsworth read a paper by himself and Prof. J. W. Cobb entitled "The Behaviour of Fireclays, Bauxites, &c., on Heating." The substances examined included silica, alumina, a red and grey bauxite, kaolin, fireclays, other hydrated compounds of silica and alumina, sillimanite, and other minerals of the same composition. Many interesting results were obtained, the outstanding points being:

(*a*) Kaolin and all the clays and shales examined show distinct heat absorption at 500° to 530° C., and heat evolution at a higher temperature.

(*b*) This heat evolution occurs at 1060° to 1130° C. with pure alumina (made by calcining aluminium nitrate at 700° C.), but at about 100° C. lower with the bauxites and clays, presumably on account of the impurities.

(*c*) Most of the materials show heat absorption at temperatures below 500° C., presumably due to the loss of water from colloid substances.

(*d*) The phenomena observed with the clays are not primarily dependent on the presence of silica. They are noticeable with alumina and with a red bauxite practically free from silica.

(*e*) For some reason, though alumina calcined at 700° C. and the bauxites and clays show marked heat evolution at about 1000° C., precipitated alumina gave no sign of it. Possibly the change responsible for the heat evolution had occurred with the precipitated alumina before the heating test was applied; but with aluminium nitrate or silicate the presence of the other material associated with the alumina deferred the change.

Replacing Furnace Arches under Retorts.

When making repairs to retort-benches, in cases where major repairs or replacements of furnace arches have been required, it has, says Mr. John W. Batten, Assistant General Manager to the Detroit City Gas Company, been customary with gas companies and bench builders to remove the entire setting of retorts, and rebuild complete from, and including, the furnace arch or such parts of the arch as needed replacement. In this way, it often occurred that good retorts and settings were torn out on account of failure of the structure. The method he suggests for replacing furnace arches consists in removing the old masonry under the centre bottom retort, and inserting successively under each joint between the retort sections a timber resting at each end on the outer wall of the combustion chamber. Then rebuilding as much of the furnace arch as necessary, beginning with the last section removed and working outwards, taking out the timbers under the retorts as each successive section is completed. In this type of construction, the original tile supports under the centre retort are replaced by brick piers. This is necessary on account of the difficulty of putting in replacement tiles to occupy fully the vertical space and make tight joints between the top of the furnace arch and the bottom of the retort. It is, Mr. Batten remarks, hard to estimate in money the value of work of this kind, as it varies with the different conditions of benches. It is, however, often possible to defer the resetting of a bench, and to keep the retorts in service a year, or perhaps two years, longer by this method than would otherwise be practicable.

It is announced that H.R.H. the Duke of Connaught has kindly consented to unveil the Roll of Honour which has been erected at the Institution of Civil Engineers to the memory of the members and students who lost their lives in the war. The ceremony will take place at 4 p.m. on Friday, Oct. 27.

Estate of the gross value of £9631 has been left by the late Mr. Thomas Henry Hazell, Secretary of the Newport (Mon.) Gas Company, and a former President of the Newport Chamber of Commerce. Estate of the value of £10,536 has been left by Mr. John Amos Lloyd, J.P., who was Chairman and Managing-Director of Messrs. John Brotherton, Ltd., tube manufacturers, of Wolverhampton, and for some years President of the Wolverhampton Chamber of Commerce.

THE AB-DER-HALDEN PROCESS OF TAR DISTILLATION.

[Further information from a Paper read at the Annual Meeting of the Société Technique du Gaz]

In the "Journal" for May 17 last, pp. 387-88, we published a short description of the Ab-der-Halden process of tar distillation as extracted from our contemporary, the "Journal des Usines à Gaz"), and reproduced a diagram showing the arrangement of the plant. This we followed-up by referring, in our "Register of Patents" on May 24, to a specification (No. 158,875) regarding the same process. In a communication to the Société Technique du Gaz at their annual meeting, M. Ab-der-Halden again described his plant, and amplified the previous information with some working details and running costs and results. We feel that the interest attaching to, and the possibilities of, the process are sufficient to warrant a reproduction of these data.

Running Details.

As was pointed out in the previous article, the speed of distillation is solely dependent on the temperature of the tar as it is traversed by the superheated steam. Though regulation of this temperature would be a difficult matter actually within the still, it is bound to vary as does the vaporous mixture leaving the still; and accordingly it is sufficient for the attendant to watch this temperature in order to regulate the output. With a gas-heated still this may be done merely by the adjustment of a cock; whereas in a coal-fired plant, the presence of a stoker is indispensable, so that such an installation cannot be recommended for treating less than 5 tonnes [1 metric ton = 0·9842 ton] per twenty-four hours.

It is clear that the throughput of tar stands in direct relation to the temperature of running; and the difficulties of maintaining regular a small flow of tar are well known. Such in fact are the difficulties which have stood in the way of certain suggestions for continuous distillation. The author, however, claims to have overcome these troubles, realizing that an irregular flow of tar through a narrow orifice is due to two main causes—to the presence of solid matter in suspension, and to variations in viscosity due to uneven temperatures surrounding it. He finds that it is sufficient, as far as the solid matter is concerned, to pass the tar through a filter-mesh of a diameter equal to half that of the inlet orifice. As for the varying viscosity, its influence on the throughput is far less, and is greatly diminished through the tar remaining several hours in the settling tank, and thus attaining equilibrium of temperature. Moreover, the dehydration and the still itself contains a mass of tar representing some ten hours' output, which fact again tends to regularity of working. The paper was accompanied by a chart showing that for a throughput varying between 500 and 700 kg. the temperature variation of the vapour mixture leaving the still was only about 5° C.

The temperature of the water flowing to the condenser is controlled by a thermometer which registers that of the outgoing light-oil vapours; and according to the desired composition of the light oils, this temperature is fixed and remains constant for a steady steam consumption. In fact, all the attendant has to do is to ensure the steadiness of two temperatures and of the steam pressure; and to this end the gauges are grouped together before him, and he is supplied with a log to keep his records. He has nothing to do with the nature of the products, which, determined originally by the management, will not vary so long as the speed of working remains constant. A specialist workman can be dispensed with, for an ordinary stoker can do the job.

The Distillates.

The number of commercial bye-products which by refinement are obtainable from gas-works tar is considerable. A medium-sized gas-works can never become a chemical works, and must confine itself to producing primary products which nevertheless are directly negotiable. In the following table the author gives figures obtained with ordinary gas-works tar in his own plant, and which represent the average of 1000 tonnes treated.

Bye-Product.	Separation Temperature °C.	Density at 15° C.	Boiling Point °C.	Percentage Proportion of Tar Distilled.
Pitch	250	1·200	..	55*
Anthracene oils.	140 to 170	1·100	250 to 350	16
Heavy ,,	100 to 140	1·045	220 to 300	10
Middle ,,	95 to 100	1·005	180 to 250	6
Dry naphthalene	95 to 100	..	..	5
Light oils	15 to 95	0·900	15 to 180	2
Ammoniacal liquor	..	..	..	6

* Three-quarters of the tar came from gas-works, and one-quarter from coke-ovens. Pure gas tar would show 60 p.ct. of pitch and 5 p.ct. of heavy oils.

All these products are directly negotiable, and the author added to the information concerning them which he included in his previous communication. The anthracene oils after filtration may be employed for firing in metallurgical work, and are much sought after

by reason of their relatively low cost and their fluidity at ordinary temperatures. The dry naphthalene finds an excellent outlet in, and is economical for, a new type of motor; while the mixture of heavy and medium oils and naphthalene constitutes the material with which limitless railway sleepers are creosoted. Finally, the light oils (quite different from those produced by intermittent distillation) can replace crude benzole in all its applications. There is no difficulty in finding an outlet for the diverse products of tar distillation.

Running Costs and Profit.

An average undertaking in the author's opinion can work with one of two objects in view—either to sell its bye-products half worked-up to a tar distillery capable of completely refining them, in which case close co-operation is called for, with a view to eliminating difficulties of over-stocking; or the gas-works must confine itself to preparing and marketing ready products such as pitch, burning oil, creosote, and light oils. M. Ab-der-Halden accepted the latter hypothesis in giving the following working expenses and estimating the profit.

He pointed out that the expenses must vary in every case according to the circumstances of tonnage, labour, fuel, &c., but he took an average case of a works producing only 2500 tonnes, and distilling this production in 170 days—*i.e.*, an average of 15 tonnes per full working day. The fuel employed was coke breeze at 47 fr. a tonne [at the time of translating this article the franc stood at 57 to the pound; but in view of widely differing conditions of labour and exchange, no point is served in making the conversion]; and the wages were taken at 1·75 fr. an hour.

Annual Cost of Process.

	Fr.
LABOUR—	
Three men working 8 hours a day for 170 days	7,140
One labourer for handling and dispatching	2,380
FUEL—	
Still heating	7,050
Steam raising	10,058
MAINTENANCE	5,000
MOTIVE POWER	500
	32,128

This works-out at a cost of 12·85 fr. per tonne of tar distilled; and the author reckons that the cost for undertakings producing between 1000 and 3000 tonnes of tar a year will be from 12 to 20 fr. a tonne.

As to profit, this again must vary very widely; but taking once more, as a typical example, the 2500-tonne works cited above, the following figures are given:

Profit.

	Fr.
EXPENSES—	
2500 tonnes of tar at 140 fr.	350,000
Working expenses	32,128
	382,128
RECEIPTS—	
1500 tonnes of pitch at 160 fr.	240,000
400 ,, anthracene oils at 375 fr.	150,000
400 ,, creosote ,, 310 fr.	124,000
50 ,, light ,, 800 fr.	40,000
	554,000

That is to say, a profit of 171,872 fr., or 69 fr. per tonne. The figures quoted relate to the simplest, but at the same time the most unprofitable, working—the manufacture of creosote oil. It is pointed out that the production of Diesel oil would bring-in an additional profit of some 20,000 fr. a year. In any case the above statistics are sufficient to show that home treatment of tar is not only a security against a bad market, but constitutes a very real source of income.

Uses for Bye-Products at the Source.

Up to this point the author had dealt simply with the possible sale of bye-products; but it was clear, he pointed out, that their value would be considerably increased by employing them at the source of production, and thus avoiding the cost of transport. He then dealt with the more important uses which it is possible for an undertaking to find for its own bye-products. Having touched on the washing for naphthalene and benzole by means of home-produced oil, he proceeded to discuss motive power. Town gas, of course, was always available for isolated power units on a works, but great economy was possible by employing some cheaper fuel; and for this reason the Diesel engine was becoming more popular. The question arose whether the distillation of tar could normally produce enough oil fuel to meet the motive power demand. It was an easy matter to decide this. According to returns made by a works producing 50,000 cub.m. per 24 hours, and handling its coal and coke mechanically, the necessary motive power is 40 H.P. per 1000 cub.m. of gas made. Relying, per tonne of coal carbonized, on a production of 300 cub.m. of gas and 40 kg. of tar, 1000 cub.m. correspond to 135 kg. of tar, the distillation of which would yield some 10 kg. of Diesel fuel. This means that there would be available per H.P.-hour, 0·250 kg. of fuel—a quantity strictly within the normal consumption of a Diesel engine. Thus the cost to a works of producing its own power would be well below that of town gas, and substantially equal to a boiler plant burning coke breeze, Finally, it was pointed out that the dry pitch, which represents some 60 p.ct. of the weight of tar distilled, can serve a useful purpose; for, though its storage presents fewer problems than does tar, nevertheless in warm weather its handling is not without difficulties. It may be profitably employed for the manufacture of ovoid briquettes by its admixture with coke dust. Of the latter there is normally produced a quantity equal to some 12 p.ct. of the coal carbonized, or 120 kg. per tonne. On the other hand, a tonne of coal carbonized yields 40 kg. of tar, of which 60 p.ct., or 24 kg., is pitch; and to make a suitable briquette, pitch equal to 20 p.ct. of the weight of the coke dust is more than sufficient. The author reckons that it is easily possible to sell these with a net profit of 15 fr. per tonne of coke dust employed.

M. Ab-der-Halden concluded his paper with some sentiments which are not without interest. He puts forward the possible objection that home distillation of tar by small works is a new departure requiring additional plant. But he reminds the industry that not so long ago undertakings were distributing gas rich in benzole and naphthalene, and running their liquor to waste; and the installation of cleaning and washing plant has been taken as a matter of course. Why not a distillery? He points out that gas has no longer a monopoly for lighting; and competition has forced down the price. By way of compensation, tar treatment and briquette making should be adopted—considered not as utopian, but as the necessary complement of a well organized undertaking.

CALORIFIC VALUE IN BALTIMORE.

Coke-Oven Gas and Carburetted Water Gas.

In July last year, a Committee were appointed by the Public Service Commission of Maryland to recommend the most economic and satisfactory calorific standard for gas in Baltimore, with special reference to the available supply of bye-product coke-oven gas mixed with carburetted water gas. Their investigations, the results of which have been embodied in a report, into the various factors affecting gas-service conditions in Baltimore proved to be intimately related to the supply of bye-product coke-oven gas purchased from the Bethlehem Steel Company. The Committee investigated the conditions obtaining in other places supplied wholly or in part with coke-oven gas—giving special attention to the heating value of such gas under the normal conditions of bye-product plant operation. Exhaustive tests were carried out at the works of the Consolidated Gas, Electric Light, and Power Company of Baltimore, to determine the relative efficiencies obtainable in ordinary gas-range top-burner operation with gases of various kinds and of different heating values; the extent to which the heating value or specific gravity of the gas may be varied without making burners unserviceable or seriously inefficient if not readjusted; and the suitability of such burners for use with gas of low heating value. In connection with the investigation, Mr. S. A. Covell (Assistant Engineer of the Commission) visited Canada and England, being accompanied in Canada by Mr. C. E. Reinicker (of the United Gas Improvement Company), and in England by Mr. A. I. Phillips (Service Engineer, American Gas Association), a member of the Committee. Finally, a study was made to determine the cost of producing carburetted water gas in Baltimore.

Up to April, 1904, straight carburetted water gas of about 22 c.p. was supplied in Baltimore; and then the Consolidated Company contracted with the Maryland Steel Company (now the Bethlehem Steel Company) for the purchase of some 4 million c.ft. per day of rich bye-product coke-oven gas. This was approximately 60 p.ct. of the average requirements; the balance being made-up of the carburetted water gas. In 1915 the Service Commission established a State calorific standard of 600 B.Th.U. monthly average; but in the case of the Baltimore Company this was conditional on a reduction in the price of gas of 5c. per 1000 c.ft., which was conceded. This standard remained in force until the end of 1918, when the shortage and poor quality of gas oil necessitated a lowering to 550 B.Th.U. Later, additional coke-ovens were completed, which enabled the Steel Company to meet the full gas requirements of the city, but of a lower quality. To permit of the distribution of this without the addition of more expensive carburetted water gas, a reduction to 500 B.Th.U. monthly average was agreed to, which standard is still in force, though in the meantime the supply of coke-oven gas (owing to business depression) has fallen off, and the Consolidated Company have found it necessary to manufacture a considerable proportion of their requirements in their own plant. The contract with the Steel Company is for the supply of 500 B.Th.U. gas, containing not more than 15 p.ct. of incombustibles; but under the abnormal conditions of the past eighteen months the value has been substantially below 500 B.Th.U., and the incombustibles more than 15 p.ct. The carburetted water gas added has, however, brought the gas supplied to consumers up to the legal standard of 500 B.Th.U. But while the heating value of the gas has remained approximately constant, its specific gravity has been substantially increased, though the changes that have occurred are within the range which it is possible to include in a single carefully-made burner adjustment.

As the result of their investigations, the Committee have found that in places supplied wholly or partially with bye-product coke-oven gas, this gas has proved entirely suitable for town use, and that it will give satisfactory and efficient service where uniform quality is maintained. Bye-product coke-oven gas is, in fact, merely a low heating value coal gas. The experience of

England and Canada has shown the Committee that gas of 500 B.Th.U., or less, can be used for domestic consumption with entire satisfaction. They have also assured themselves that gas having a heating value of 500 B.Th.U. will give efficient service in appliances commonly in use at the present time in the United States. Any service difficulties that may have arisen in Baltimore during the past eighteen months they attribute principally to the change in the specific gravity of the gas; and as with a supply of coke-oven gas variations of this character will be liable to occur in times of business depression, the Committee recommend the Commission to require the Consolidated Company to make prompt adjustment of any consumers' appliances free of charge upon receipt of complaint.

The price paid by the Company for the coke-oven gas (which is based upon the price of coal and upon the heating value of the gas supplied) is substantially less than the cost of manufacturing carburetted water gas in their own plant; the difference being as much as 17 c. to 18 c. per 1000 c.ft. under present price conditions. The Committee are of opinion that the Consolidated Company could not make bye-product coke-oven gas in a plant of their own at a cost comparable with the price they now pay the Bethlehem Steel Company; and considering all the factors connected with the character and cost of the service, they feel that the interests of the consumers will best be met by encouraging the Consolidated Company to distribute the maximum quantity of bye-product coke-oven gas obtainable from the Bethlehem Steel Company. They recommend that the present standard of 500 B.Th.U. monthly average be retained in Baltimore, together with the existing minimum of 490 B.Th.U. and maximum of 520 B.Th.U.

The report also includes as an appendix a lengthy discussion of the supply of city gas from bye-product coke-ovens, by Mr. Alfred I. Phillips, as well as a full account of the laboratory tests made at the Spring Gardens plant of the Consolidated Company.

Price Reduced at Wigan.—The Wigan Corporation intimate a reduction in the price of gas of 4d. per 1000 c.ft.—from 5s. 4d. to 5s.

Cheaper Gas at Neath.—On the recommendation of Mr. W. C. Jackson (the Gas Manager), the Neath Town Council have reduced the price of gas by 1d. per therm, bringing down the charge to 5s. 6d. per 1000 c.ft.

Difficulties at Nantwich.—In announcing a prospective reduction in the price of gas to the Nantwich Council, the Chairman of the Gas and Lighting Committee (Mr. Rollings) said that only those in close touch with the works knew the difficulties which the Gas Manager and the Committee had had to overcome in pulling the undertaking round to what he might say was a paying proposition. In fixing the reduction, the Committee would have to bear in mind that the old reserve had been used up, and that a new fund would have to be created.

Bradford Strike Threat.—Threat of a strike occurred among the Bradford Corporation Gas Department retort men of the Birkshall works last week, owing, it is understood, to the men being asked by the Committee to take charge of six retorts per man instead of five. It was pointed out to them that there were gas-works in other towns where the men put in far better service in the number of retorts under their care; and one large city was quoted in which there is one man to twelve retorts, as against Bradford's one man to five. A consultation took place between the Committee and the men's representatives on Friday; and though no official statement has been made, it is understood the point in dispute has been deferred for a fortnight, to enable further inquiries into gas-works practice generally.

Salford Coal Contracts and Gas Price.—Favourable coal contracts were urged at a meeting of the Salford Town Council last Wednesday as a reason why still cheaper gas should be supplied to consumers. Mr. Finburgh asked the Chairman of the Gas Committee whether, in view of the fact that they had just sanctioned the purchase of 57,000 tons of coal, he could hold out any hope of a reduction in the price of gas. Alderman Phillips regretted that he could not do so. They had made a reduction of 6d. per 1000 c.ft., which began with the quarter ended Sept. 29. The accounts for the first quarter after the reduction were just going out; and to ask the Committee for another decrease, before they had paid off the deficit balance of £51,000, was asking them to move too quickly. Instead of the Gas Department having reserve funds, the Council had taken all their money, and the Committee were dependent on the course of events.

Oswaldtwistle Gas Manager and his Treatment.—Mr. J. H. Davies has tendered his resignation as Manager of the Oswaldtwistle Gas-Works. This came before the Committee last Thursday, when the whole question was discussed. It was decided, by seven votes to one, not to accept the resignation. Mr. Davies was then asked to withdraw his notice; and as he declined to do so, the Committee urged him to reconsider the matter, which he agreed to do. Mr. Davies subsequently stated that his resignation was not due to any wage consideration, nor was it a mere diplomatic move. He was weary of the constant pin-pricks and thrusts from a certain quarter. No official could concentrate his attention upon his duties in such circumstances; and his resignation was actuated by the fact that he was tired of the efforts being made, in a certain direction, to arouse public feeling against him. He had done his best to make the Oswaldtwistle works one of the most efficient in the country, and to reduce the charges for gas to the lowest level; and the results spoke for themselves. They had not been achieved by mere attendance at the gas-works at 9 a.m. every morning, but by a study of the latest developments of manufacture, and by research work. He did not object to fair criticism, but protested against these personal attacks. He would not have tolerated the position so long, but for the knowledge that he had the full confidence of his Committee. There has been a further cut of 6d. in the price at Oswaldtwistle, bringing the charge down to 2s. 7d. per 1000 c.ft.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Therm: A Scientific Unit, *not* a Consumer's Unit.

SIR,—I have attempted to summarize in the above heading what I believe to be the resultant of all the various ideas upon the therm which have been expressed in your colums recently.

The case for the therm as a scientific unit is fairly well made out. It enables comparisons of costs, efficiencies, &c., to be made on a uniform basis, and is unquestionably useful from the gas engineer's point of view. A perusal of the so-called advantages urged from the consumer's point of view, however, shows that there is no case at all. Over and over again we have been told that in paying for therms the consumer pays for actual value given, and that payment by calorific value is better than payment by volume. But we *don't* pay by calorific value. We still pay by volume, with a guarantee that this volume will have a certain calorific value.

The declaration and control of calorific value is the one great advantage of the Gas Regulation Act from the consumer's point of view. Paying for therms does not ensure that you get them. It is the gas examiner who does that, by periodical testing. So long as gas is metered by volume, the therm will continue to be an anomaly as far as the consumer is concerned.

The letters in your issue of Oct. 4 from "A South Metropolitan Consumer" and "Oikonomia" put very pointedly two arguments against the therm; and with all respect, Sir, your editorial comment on the first letter is anything but an answer to the question. The case against the therm as a consumer's unit seems to me unanswerable. What is the gas industry going to do about it?

26, *Muncaster Road Clapham Common, S.W., Oct.* 9 1922. ARTHUR CUNNINGTON.

REGISTER OF PATENTS.

Waste-Heat Liquid Evaporators.—No. 185,134.

HOCKING, H., of Liverpool.

No. 5563; Feb. 18, 1921.

This invention relates to liquid evaporators in which the liquid to be heated is caused to flow past and round a series of radiators which are heated internally by waste gases, such for example as the exhaust gases from an oil or gas engine.

The object of the present invention is to provide an improved construction, in which access to the radiator tubes is readily obtained. It consists of a liquid evaporator comprising a readily removable hollow cover portion formed into two chambers by a diagonal diaphragm one of which chambers is the inlet chamber and the other the outlet chamber for the gases. Tubes are secured by their ends in the diaphragm and constitute the inner tubes, while the outer tubes are secured by their open ends to a tube-plate disposed between the removable cover and the interior of the body of the evaporator which contains the liquid. The tubes are nested one within another in pairs, the inner tubes of each pair being removable as a whole with the hollow cover portion.

The heater is thus so made that access to the tubes, both inside and outside, is readily had by removing the cover portion described above, so that the deposit which may come from the gases—such as grease—and that which may deposit from the water or liquid on the tubes, can be easily and quickly removed. Deposit from the gases will take place on both sides of the inner tube and on the inside of the outer tube, which is closed at its outer end; and being immersed in the liquid, the outer tube will receive on its outside scale or deposit from the liquid.

Pipe Joints.—No. 185,224.

DOLLMAN, H., of Moseley.

No. 15,187; June 1, 1921.

This invention relates to means for coupling together pipes, and refers to that class of coupling employing non-metallic packing disposed between the ends of a pair of pipes and spigot and socket members thereon; the packing being contained and compressed in the socket member by the spigot member which is slidable therein.

The invention has for its object to provide a generally improved construction; and in this joint the packing is adapted, by means of inclined surfaces on the socket and spigot members, to be compressed and forced inwardly between the ends of the pipes, which project beyond the adjacent surfaces of the said members.

Further, the socket member may be provided with holes or slits for the purpose of enabling the packing to be held in place during fixing. The spigot and socket members may be screwed upon the extremities of the pipes, and may be drawn together by bolts; or the exterior of one member may be screw-threaded and the exterior of the other provided with a shoulder which is engaged by a nut screwing on to the thread so as to draw the two members together.

Carbonizing in Vertical Retorts.—No. 185,461.

WOODALL, DUCKHAM, AND JONES (1920), LTD., and DUCKHAM, SIR A. M'D., both of Grosvenor Gardens, S.W. 1.

No. 12,675; May 3, 1921.

In the operation of carbonizing fuel in externally heated vertical retorts with steaming, the proportion of steam permissible depends on the temperature of the coke, which temperature has been reached by

the carbonization of the mass of coal in the retort; and it has not been found profitable to extend the external heating of the retort to the part containing the coke, so as to maintain the temperature of the latter to such a degree that an increased amount of water gas can be made. With a view to raising the temperature of the coke in the lower part of the retort, it has been suggested that air should be introduced with the steam; but the large proportion of nitrogen thus added to the coal gas depreciates the value of the latter.

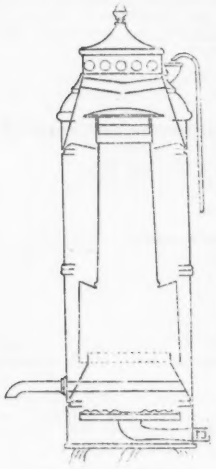
By this invention the temperature of the coke at the lower part of the retort is maintained for the purpose in question by introducing oxygen together with the steam, or alternately with the steam. The oxygen may be diluted with a certain proportion of nitrogen—say, 40 p.ct. of its volume; but the quantity of nitrogen must not exceed that which, when mixed with the gas produced by the carbonizing process as a whole, would bring the percentage of nitrogen to the maximum permissible with respect to the calorific value of the gas. By adopting this mode of internally heating the coke in the lower part of the retort, not only is the temperature better maintained, so that the output of water gas, and hence of total gas, is increased, but the cost of externally heating the lower part of the retort is saved. The oxygen is preferably admitted together with the steam.

Geysers.—No. 185,288.

PARRAM, R. W., of South Tottenham, N. 15, and CONWAY, J. K., of Highgate, N. 6.

No. 19,425; July 19, 1921.

This invention relates to geysers, and consists of an outer cylindrical case closed at a short distance from the bottom by a ring which is coned upwards and thus allows the heated water to collect and be drawn off by a pipe which is continued through the flame, and is constructed so as to present a large surface to the flame. Above the coned ring is a canopy placed so as to leave a space between its inside and the ring; the top being slightly dished downwards towards an opening which admits the end of a long taper chimney. There is a baffle cover or cowl thereon.



Parram and Conway's Geyser.

Within the casing and surrounding the top of the tube is a conical wall which, with the upper part of the casing, forms a ring receptacle for receiving water; and from this ring wall above the chimney is positioned a dish-shaped trough having an aperture above the dome of the tube. The inlet spout is fitted to the casing. Just below the top casing is a dished plate with an opening all round the tube. This is important in the action of the burner, giving an intensifying effect to the flame heating through the oval tube.

The atmospheric burner is of a special kind covered by another patent application—No. 19,424 of July 19, 1921; and the end sought is economy in the generation and conservation of the heat.

Gas-Burner.—No. 185,485.

RAMBUSH, N. E., of Stockton-on-Tees.

No. 15,139; May 31, 1921.

A burner constructed according to this invention is of the kind in which secondary air is admitted under pressure into a flame of a mixture of primary air and gas; the object of the invention being to introduce at the seat of the flame a small amount of secondary air sufficient to complete the combustion of the gas.

The primary air and gas are separately admitted under pressure into the mixing chamber, which is packed with material suitable for promoting thorough intermixture; and the secondary air is injected under pressure into the seat of the flame through a tube coaxial with the nozzle at which the mixture burns, but which has an emission area very much smaller (for instance, less than 5 p.ct.) than that of the nozzle. The combination of these features constitute, says the patentee, the novelty of the invention.

Low-Temperature Carbonization.—No. 185,684.

YEADON, J. A., of Leeds.

No. 32,546; Dec. 5, 1921.

This invention, the patentee says, consists in the application of a new and improved combined process of low-temperature carbonization of coal, by which he signifies a carbonizing temperature inside the retort of from 400° to 700° C., according to the nature and quality of the coal being utilized and the bye-products required; the gases thus generated from the coal being primarily intended for the production of oils, petrols, paraffin wax, or other analogous bye-products, and not chiefly for ordinary illuminating purposes.

A feature of the method is a horizontal feed cylinder fitted with an internal revolving shaft and adjustable blades, so set as to convey the fine coal continuously forward to the mouthpiece fixed on the top of the retort. The shaft and knives are so arranged that there is always a certain quantity of the fine coal tightly compressed at the discharge end of the cylinder, so as to form a seal and prevent any escape of gas or ingress of air.

The claims cover: An improved method or process of low-temperature carbonization of coal, in which finely-ground coal, dried and partially heated, is fed continuously and mechanically through a self-sealing outlet into a mouthpiece fixed on the top of the retort, whence it descends continuously in a fine spray through the retort. The retort is of the fixed, vertical type, having parallel sides and oblong horizontal section, and has its internal surface vertically corrugated the full length, thus securing double heating surface and causing the fine coal to become quickly carbonized in its descent. The feeding of the fine coal and the discharge of the coke are each so arranged as to work mechanically and continuously, with a self-sealing outlet preventing egress of gas or ingress of air.

Conservation of Heat from Gas-Fires. No. 185,689.

DANIN, J., of Brockley, S.E.

No. 33,917; Dec. 16, 1921.

This invention relates to gas-fires of the type in which at the rear of or adjacent to the radiating surface is provided a box divided into compartments wherein the products of combustion from the fire are led in a circuitous manner to the flue situated at the rear; the whole of the receptacle thereby becoming heated, and an increased heating effect being secured.

The improvements which characterize the present invention are embodied in an arrangement so that by shutting off the connection with the main flue, the heat within the receptacle is conserved when the gas is turned off. The gas supply valve is interconnected with the flue damper or regulator so as to ensure the correct manipulation of both. In order to ensure the greatest advantage of this conservation of heat, the front of the fire may be provided with an enclosing plate to prevent the cooling of the mass by the draught of cold air on to the front.

Prepayment Mechanism.—No. 185,691.

BERRY, J., and MAYLOR, J. A., both of Oldham, and METERS LIMITED, of Manchester.

No. 34,548; Dec. 22, 1921.

This invention relates more particularly to the means by which the coin inserted in prepayment meters actuates the valve to ensure the delivery of the quantity of gas for which prepayment has been made. Heretofore it has been proposed, say the patentees, to cause the inserted coin to engage the teeth of a spur pinion upon a spindle carrying the pinion which rotates the crown or similar wheel of the prepayment mechanism; but difficulties have been experienced, due to the coin becoming wedged between the teeth of the spur pinion and the walls of the coin insertion slot.

This invention has for its object to overcome this difficulty, and comprises the combination with the rotary coin holder and a spur pinion engaging the crown wheel of a pinion (in operative connection with the spur pinion), with which the coin engages, having each of its teeth with one flank radially disposed with relation to the pinion axis and the other flank curved with a relatively long curve.

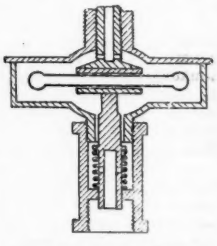
Safety-Device for Burners.—No. 172,629.

CERNARIC, J., of Antwerp.

No. 32,585; Dec. 5, 1921. Convention date, Dec. 7, 1920.

This invention relates to preventing the escape of gas from accidentally opened lighting or heating burners by a device comprising a so-called gas-chamber having an expansion chamber closed by an internal diaphragm, the expansion of which, produced by the rise of temperature, causes a valve to be opened.

The characteristic feature of the device resides in that the expansion device is construc'ed as a thermal capsule containing a very volatile liquid (varying with the different countries where the device is to be employed); the capsule being arranged within the gas chamber. A cross-sectional drawing is reproduced. Except for stating that the capsule is attached to the sides of the gas chamber, and that the mushroom head of the outlet is secured with a clearance of about 1 mm. from the capsule, the construction is evident from the illustration.



A Belgian Safety-Device.

The valve will normally be held on its seat by the action of the spring. After the cock of the burner has been opened, gas will be prevented from entering the gas-chamber or the burner, as the valve remains on its seat. But if by means of a match or the like, the wall of the gas-chamber is slightly heated during a few seconds to a temperature of 30° to 70° C. according to the climate, the capsule will be expanded and will unseat the valve. As the burner is lighted, it will be heated, and the heat thereof will be transmitted through the metal parts to the capsule, whereby the latter will be held in an expanded condition and continuously admit gas to the burner. As the burner is put out, it will be cooled (after 4 to 10 minutes) and the thermal capsule will be contracted.

Gas Companies and the Therm.—Mr. F. W. Goodenough, who has been doing excellent work in correcting popular misapprehensions with regard to the therm, marked a further stage in his campaign on Tuesday of last week, when he addressed the Chelsea Chamber of Commerce upon the subject.

Dronfield Council and the Gas Company.—The Dronfield Urban District Council have definitely rejected the offer of the Gas Company to light the street lamps for 34s. each. The Council also decided to send to the Board of Trade their objections to the application of the Gas Company for power to substitute 1s. 9d. and 2s. respectively per therm for the present maximum prices of 5s. 6d. and 6s. 6d. per 1000 c.ft.

MISCELLANEOUS NEWS.

GAS-MANTLE COMMITTEE'S REPORT.

Importations from Germany.

There is given in the "Board of Trade Journal" dated Oct. 5 the text of the report of the Committee appointed under the Safeguarding of Industries Act, Part II., to inquire into a complaint by the Incandescent Mantle Manufacturers' Association with respect to mantles manufactured in Germany and imported into this country. The Chairman of the Committee was Sir Bernard Mallet, K.C.B. Evidence was heard from seventeen witnesses, of whom nine were called on behalf of the complainant Association, and eight on behalf of the opponents. Notices of opposition were received from the National Gas Council, and on behalf of a number of British importers and other interests, including the New Inverted Incandescent Gas-Lamp Company, Ltd., and Messrs. George Hands & Co. After the hearing had begun, the Convention of German Mantle Manufacturers were represented, and two witnesses heard on behalf of that body. Mr. Sholto S. Ogilvie gave evidence on behalf of the National Gas Council, of which he is Joint Manager. The proceedings at the public sittings were reported in the "JOURNAL" for June 14 (p. 639) and June 28 (p. 897).

During the war, the Committee say, considerable extension and development took place in the English mantle industry. Thorium manufacture was established, and the output of the other materials was increased, with the result that all the materials necessary for mantle making can now be obtained in this country, and that the capacity of the British factories is approximately equal to national requirements. Meanwhile, German imports, which disappeared during the war, and in 1920 were 3 million mantles, rose in 1921 to 9 millions, and have further risen in 1922 to a rate of 16 millions. They wish to make it clear that the question, and, under their terms of reference, the only question, with which they are concerned, is whether the present steadily rising importation is, in fact, at prices below the minimum of profitable manufacture in this country; whether this, if so, is due to the influence of the exchange; and whether its effects are, or may become, serious as against an industry efficiently conducted here.

They wish further to make it clear that throughout their inquiry they have as far as possible confined themselves to the consideration of the two standard types of mantles known as the "C" upright and the "Universal" inverted respectively. It is generally agreed that these two standard types represent about 90 p.ct. of the trade both in home-made and imported mantles, and that they are manufactured in about equal proportions. There are minor variations of price within these standard types, based on manufacture; but the mantles in each of the two types are identical as regards shape and size. Apart from these standard types, there is a small proportion of slightly cheaper mantles of smaller size, and a number of more expensive types of higher candle power. These two classes of non-standard types are comparatively unimportant; and, as in a consideration of the trade as a whole they approximately counter-balanced one another, the Committee have disregarded them.

GERMAN MANTLES.

The prices at which German mantles are exported to this country are officially regulated in Germany on the advice of a Convention comprising all the mantle manufacturers in the country. Under this Convention, the following fixed minimum prices have been in force from time to time for the export of the ordinary types of standard mantles free to door in England:

From Sept. 23, 1920	46s. 2½d. per gross	
,, March 21, 1922	37s. 7d. per gross	to wholesalers
	41s. 10½d. ,, ,,	retailers
,, April 22, 1922	34s. 6d. ,, ,,	wholesalers
	38s. 0d. ,, ,,	retailers

It should be noted, however, that these prices do not take into account the duty under Part I. of the Safeguarding of Industries Act on the thorium and cerium content of gas-mantles, which the Committee are informed is equivalent for the standard types to a duty of about 5 p.ct. on the value of the whole mantle. This duty was not properly in operation at the time of the hearing of evidence; and they are unaware of the precise effect it will have on prices. But this effect cannot in any case be considerable.

While accepting evidence put before them, that evasions of the Convention prices have occurred, the Committee recognize that it is to the interest of the German manufacturers and Government to maintain these prices, and are not convinced that these evasions have been of great frequency or importance. They are therefore in the main satisfied that the bulk has come in at the Convention prices.

It will, they proceed, be of interest to compare the current Convention prices quoted above with the corresponding prices which merchants and wholesalers have to pay for English mantles, as the latter may be taken as some indication of current costs of manufacture in this country. In March, 1922, an all-round reduction of some 6s. or 7s. per gross was made by the English Association; and from their price-lists revised at that time it appears that minimum wholesale prices vary from about 47s. to about 54s. per gross. Further, the Incandescent Mantle Manufacturers' Association are now offering a special rebate of 3s. per gross on advertised brands, and 2s. per gross on non-advertised, to dealers who handle British-made mantles only.

COSTS OF MANUFACTURE.

The Committee have had before them the accounts of certain firms in the Manufacturers' Association, chosen as being representative. The lowest of the costs the Committee have examined is more than 50 p.ct. in excess of the price at which the German mantles are sold; and they consider this difference is too great to be substantially affected by any qualification they may make. The opponents have asked them to accept as an indication of the real minimum cost of manufacture certain offers and actual sales by British manufacturers at prices ranging from 36s. to 40s. per gross; but on the whole they are not disposed to set any higher value on these low prices (as an indication of the lowest profitable cost of manufacture in this country) than on the sales below the German Convention price as an indication of the real selling price of imported German mantles. Even, however, if they assume that the lowest average price submitted by the opponents is a real price such as might be offered by the Association, they find an appreciable margin between that price and the price at which, in fact, wholesale importers in this country are buying German goods in bulk.

ABILITY OF GERMANY TO UNDERSELL.

With regard to the question whether this ability of the Germans to undersell the British manufacturers is due to the depreciation in the value in relation to sterling of the German currency, the Committee say from the accounts submitted to them it appears that the cost of materials, fuel, and power alone in the English factories exceeds the exchange value of the total cost of manufacture in Germany. The kernel of the whole German export position lies in the answer given by the chief German witness to a question whether their export prices bear any relation to the home production costs or home profits. His reply was: "We practically consider only the price of the country to which we send. That is the principal point."

SALES AND EMPLOYMENT.

Pre-war figures of gas-mantle imports from separate countries are not to be had; but the recent course of imports is set forth in the following table:

—	From Germany.		From Other Countries.		Total.	
	Gross.	£	Gross.	£	Gross.	£
1920. . .	21,357	51,710	56,998	125,506	78,357	177,216
1921. . .	63,756	111,917	47,780	92,915	111,536	204,832
1922 (Jan.-June) .	56,823	86,123	17,072	30,067	73,897	116,190

Sales by the Associated firms have been as follows:

	Gross.
1920.	443,731
1921	275,931
1922 (first quarter)	64,619

To arrive at the total British sales, an addition must be made to these figures for the sales of the firms outside the Association. These have recently amounted to about 5 p.ct. of the total sales.

Exports of British mantles fell from 51,737 gross in 1920 to 21,005 gross in 1921. A German witness attributed this to American competition.

It is to be noted from the above tables that, while the sales of Associated British firms fell by about 168,000 gross in 1921, the increase in German imports was 42,000 gross, or 25 p.ct. of the fall. Further, that while other foreign imports are declining, German imports are growing, being now, in fact, 75 p.ct. of all imports and one-third of the whole gas-mantle trade of the country. Recent imports have probably been stimulated by the desire to anticipate a possible British duty and the rise in German home prices.

The effect of this decline in sales on employment in this country is shown in the following figures given by the complainants:

—	Number of Workers.	Average Hours per Week Worked.	Total Hours per Week Worked
1920—1st quarter	3132	49·45	154,877
2nd quarter	3271	47·45	155,208
3rd quarter	3286	47·62	156,479
4th quarter	3262	46·5	151,683
1921—1st quarter	2963	36·2	107,260
2nd quarter	2493	31·0	77,283
3rd quarter	2360	35·4	83,544
4th quarter	2230	37 79	84,295
1922—1st quarter	1658	39·9	66,158
Week ended May 26 . . .	1158	41·72	48,307

The complainants stated that there has also been a large falling-off in employment in the subsidiary industries of thorium, ramie, and magnesia ring manufacture.

The complainants point to German imports as the chief cause of the present depression. This claim could not be sustained by the 1921 figures taken alone. It is strengthened by the figures for 1922, which, after allowance for special circumstances, indicate a further growth of German business coincident with a decline of production from other sources. But the determining fact lies in the operation of the German Trade Convention and the prices, domestic and export, fixed by it. These prices admittedly bear no relation to German costs of production; they are based on policy. While German mantles can be sold profitably at 21s. wholesale in Germany, they are offered here at 34s. 6d. wholesale free to door. German Convention prices can still fall a long way before they approach their domestic wholesale price of 21s. This is the main fact on which the conclusion is based that the results of German gas-mantle importations, present and prospective, are serious in their effect upon employment in the industries concerned. Whether a duty of 33⅓ p.ct. would, under the conditions detailed above, benefit the British maker, is a separate question which the Committee are not called upon to answer.

The only evidence given as to the effect which the imposition of a duty on gas-mantles would exert on employment in any other industry was given on behalf of the gas industry. Without expressing any opinion as to whether that industry can be regarded as using gas-mantles *as material*, the Committee think that the effect on that industry of a duty on mantles would be negligible. They know of no

other industry which could possibly be regarded as using gas-mantles as material.

EFFICIENCY OF BRITISH INDUSTRY.

It appears to be generally agreed that, as regards equipment of the factories and methods of manufacture, the British industry is in every way as good as the German. The Committee see no reason for doubting that the quality of British mantles in general is fully equal to that of the German. They are inclined to think that the industry is over-capitalized, a condition which may affect its overhead charges; but they feel that if they take into account the special circumstances under which it was developed during the war, they are justified in finding that it is conducted with reasonable efficiency and economy.

THE COMMITTEE'S CONCLUSIONS.

The Committee summarize their conclusions as follows:

(i) We are in the main satisfied that the bulk of the German mantles which are imported into this country are sold to dealers at the prices fixed by the Convention of German Mantle Manufacturers.

(ii) This price is very much above German manufacturing costs, very considerably lower than the costs of manufacture of the principal British manufacturers, and distinctly lower even than the lowest prices of British mantles quoted by the opponents as an indication of the real minimum cost of manufacture in this country. We find that the difference between the costs put before us by the principal British manufacturers and the price of the German goods is so large as not to be substantially affected by any qualification we may make with regard to the former

(iii) We are of opinion that this capacity to undersell is principally due to the advantage which the Germans derive from their low costs in respect of labour, salaries, and other overhead charges, when reckoned in sterling, for the reason that these charges have not increased in proportion to the decrease in the exchange value of the currency. This advantage is not offset to any appreciable extent by any necessity to purchase raw materials abroad.

(iv) We are of opinion that, in view of the progressive rise in German imports, coincident with a decline from other sources, and in view particularly of the wide margin between German domestic wholesale prices and the Convention selling price in Great Britain, these imports have, and are likely to have, a serious effect upon employment in the home gas-mantle trade.

(v) We are not convinced that the imposition of a duty on gas-mantles would have any appreciable effect on employment in the gas industry, which is the only industry which, we think, could possibly be considered as using mantles as *material*.

(vi) We are of opinion that the gas-mantle industry is over-capitalized, and that this fact must tell against full economy in cost control, but that, as regards processes of manufacture and use of materials, it is up-to-date and efficiently conducted.

An Import Duty Imposed.

The Board of Trade announced on Saturday that they have made an Order, which comes into force forthwith, applying Part II. of the Safeguarding of Industries Act to mantles for incandescent lighting and component parts thereof, whether finished or not, manufactured in Germany. The effect of the Order, which is published in the Statutory Rules and Orders series (Safeguarding of Industries (No. 2) Order, 1922), is to impose an import duty of 33⅓ p.ct. *ad valorem* on the class of goods referred to, if manufactured in Germany.

In exercise of the powers conferred on them by section 5 of the Act, the Board of Trade have directed that Certificates of Origin shall be required so far as concerns the class or description of goods covered by the Safeguarding of Industries (No. 2) Order, 1922, in the case of goods consigned from all foreign countries in Europe.

The form of Certificate of Origin already prescribed by the Board of Trade in connection with the previous Order (No. 1) will be applicable.

Harwich Gas Company's Capital Issue.—The £15,000 new capital which Messrs. A. & W. Richards offered to tender for the Harwich Gas and Coke Company in the form of irredeemable preference shares of £5 each, carrying 6 p.ct. dividend, has all been allotted at prices ranging from £5 5s. to £5 a share.

Another Reduction by the Gas Light and Coke Company.—Following on a reduction of 2d. per therm, to 11d. per therm, as from last June, the Directors of the Gas Light and Coke Company now announce a further reduction of 1d. per therm (5d. per 1000 c.ft.) in the price of gas consumed after the reading of the meters for the September quarter. The charge for gas, therefore, for the quarter ending December will be 10d. per therm, or 4s. 2d. per 1000 c.ft.

Dorking Gas Company.—It was stated in the report adopted at the half-yearly meeting of the Company that the accounts for the six months ended June 30 showed, after providing for interest on debenture stock, a balance available for division of £3195; and the Directors recommended the payment of dividends at the rate of 6 p.ct. on the "A," "B," and "C" shares, and of 5 p.ct. on the "D" shares. This would absorb £1400, and leave a balance of £1795 to be carried forward. As indicated in the last report, an Order had now been received from the Board of Trade, under the Gas Regulation Act, authorizing a maximum price of 1s. 7d. per therm in the Company's inner area, and 1s. 7 6d. per therm in the outer area. The new system was put into operation at the commencement of the June quarter, the rate charged being 1s. 6d. per therm. The Directors had decided further to reduce the price of gas to 1s. 5d. per therm from the beginning of the December quarter. Major H. H. Young, who presided, said the Directors were very pleased to be able to fulfil the hope expressed at the last meeting of presenting a more favourable state of affairs. It was a source of much satisfaction that they had announced a further reduction in the price of gas of 1d. per therm, equivalent to 4½d. per 1000 c.ft.—making in all 7¾d. per 1000 c.ft. since Jan. 1 last—and at the same time recommended a dividend similar to their pre-war rate.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" regarding applications to the Board of Trade for Orders under the Gas Regulation Act.

DECLARATIONS OF CALORIFIC POWER.

Altrincham Gas Company.—450 B.Th.U. (Dec. 31.)
Folkestone Gas and Coke Company.—480 B.Th.U. (Jan. 3, 1923.)
St. Annes-on-the-Sea Urban District Council.—500 B.Th.U. (Dec. 15).
Sevenoaks Gas Company.—450 B.Th.U. (Jan. 1, 1923.)
Tavistock Lighting, Coal, and Coke Company, Ltd.—500 B.Th.U. (Oct. 5.)

SPECIAL ORDER.

Burnham Gas Company, Ltd.

The Company notify their intention to apply to the Board of Trade for a Special Order to enable them to raise additional capital.

GAS REGULATION ACT ORDER.

The Director of Gas Administration has forwarded a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Arundel Gas Company.

After the declared date: (i) The standard price in respect of gas supplied by the undertakers shall be 16 6d. per therm; (ii) the price of 16d. per therm shall be substituted for the price of 3s. 9d. per 1000 c.ft. mentioned in the second proviso to section 63 (dividend dependent on price charged) of the Arundel Gas Act, 1897.

For the purpose of ascertaining the authorized rate of such dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-three-tenths. (Oct. 6.)

SULPHATE OF AMMONIA PRICES.

For November and December Delivery.

The British Sulphate of Ammonia Federation, Ltd., in their September circular, offer to sell sulphate of ammonia for home agricultural use as follows:

For November and December Delivery.

£16 13s. per ton for neutral quality in fine friable condition, free from lumps, basis 25¾ p.ct. ammonia.

Delivered to consumer's nearest station or wharf in Great Britain, for prompt cash payment, in lots of 4 tons and upwards, with higher charges for smaller lots.

Limited quantities of ordinary quality will be available in some districts, and will be sold at 23s. per ton less than the above prices, basis 25¼ p.ct. ammonia.

No quantities bought at these prices may be exported.

Attention is drawn to the fact that, owing to the coal strike in America, the world's supply of sulphate of ammonia will probably be curtailed to an even greater extent than was thought likely two months ago.

When the price of

Nitrate of soda is	£12,	sulphate of ammonia is worth	£16	5s.	0d.	per ton.
,,	,,	£12 10s.	,,	,,	,,	£16 18s.	6d.	,,
,,	,,	£13	,,	,,	,,	£17 12s.	0d.	,,

PADIHAM GAS DEPARTMENT.

Mr. A. F. Ames, Gas Manager to the Padiham Urban District Council, in his annual report, states that the gas sold continues to increase steadily, having been last year 8·4 p.ct. more than in the previous year. The output (103,048,000 c.ft.) was a record one; and practically the whole of the increase was on the day load.

The unaccounted-for gas was 2·07 p.ct., compared with 4·08 p.ct., and this figure is one of the lowest in the country. There was a slight reduction in the gas made per ton of coal, but this was due to the inferior quality during the strike, and to the vertical retorts being out of use for overhauling and repairs in the summer months. The gross profit of £4365 is equal to 13·9 p.ct. on the department's outstanding debt. Interest on annuities, loan, and sinking fund contributions absorbed £4132, leaving a net profit of £234, as compared with £2530 for the previous year. As a result of the increased gas consumption, the capital charges, which in 1919 were 13·28d. per 1000 c.ft. of gas sold, have been reduced to 9·82d.

Mr. Ames considers the result very satisfactory, in view of the conditions prevailing. Padiham was one of the places that maintained an uninterrupted supply of gas throughout the strike—a great boon to the consumers during the trying period. The prospect for this year is much brighter, owing to the reductions in the price of coal and materials and the fall in wages. Taking this into consideration the price of gas was reduced by 8d. per 1000 c.ft. from April 1, which represents a saving to the consumers of £3300 during the current year.

The Abergele Urban Council have kept the town in darkness at night for a month or so, as a mild protest against the charge of 8s. 4d. per 1000 c.ft. by the Gas Company. Seeing that there were no hopes of a reduction, they have now renewed the lighting.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly Meeting of the Company was held at the Offices, D'Olier Street, Dublin, last Thursday week—Mr. JOHN MURPHY (the Chairman) presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said he was glad to be able to submit a statement which would be considered satisfactory, in spite of the abnormally difficult times through which they had passed. The salient features of the half-year's working were an increase in the total quantity of gas sold, and a reduction in most of the principal items of expenditure on revenue account. If a reasonable prospect of the continuance of such conditions still existed, he would probably have been in a position to announce a more substantial reduction in the price of gas. Unfortunately, however, since the disturbances which occurred in Dublin at the latter end of June and the beginning of July, a considerable falling off in the output of gas had taken place. This, of course, had adversely affected costs of production. It was their intention to reduce the price of gas to the fullest extent possible, in order that consumers and stockholders might derive all the benefit which lay in their power to grant them. From the reading of the meters in December next, therefore, the price would be again lowered 1d. per therm, equivalent to 4½d. per 1000 c.ft. The cost of coal and oil had fallen by the substantial sum of £36,299. At the same time, it must not be lost sight of that it was seldom possible to gain any advantage from a saving in cost of either coal or oil unless it was accompanied by at least a stable residual market. The receipts from residuals showed a reduction of no less than £42 608. This actually meant that the net cost of coal was greater, instead of less, than in the corresponding period by over £6300. The renewal of the various sections of the manufacturing plant to which he had referred on previous occasions had now for the most part been completed, with results in every instance fully justifying the expenditure. By adopting an installation of the best and most up-to-date type of vertical retorts, they had been able to dispense with a substantial portion of the old horizontals, and at the same time to manufacture at the city works the gas required for the Kingstown and Bray districts, thus enabling them to shut-down the works at those places. This should effect considerable economy. It was a matter of great regret to the Board that the closing-down of the works referred to necessitated dispensing with the services of a number of old hands. Every employee, however, received generous consideration in the form of a gratuity based upon the actual years of service with the Company; and this settlement was considered quite satisfactory by the men and their Union. To sum up, expenditure for the half year was down to the extent of £80,000, while income was less by £64,000, and thus they were enabled to carry into the net revenue account a profit larger by the sum of £16,000. The balance of profit available would permit of the payment of the maximum statutory dividend of 5⅝ p.ct. per annum; but they could not recommend on this occasion a larger dividend than 5 p.ct., for the reason that the reserve fund required strengthening, and this could only be done out of divisible profits. They had, accordingly, made an appropriation of £4849 to the reserve fund, and the sum of £3912 remained to be carried forward. There appeared to be every reason, with a return to normal conditions, for confidence in the Company's prospects.

The report and accounts were adopted, and the dividend recommended was declared.

HALIFAX GAS CENTENARY.

The centenary of the Halifax Gas-Works undertaking occurs this week. To-morrow (Thursday) the Town Council are to make a formal inspection of the works before their meeting, at which no doubt reference will be made to the occasion.

When gas was first supplied in Halifax in 1822, it was manufactured by the Halifax Gas Light and Coke Company, from whom the Corporation purchased the undertaking in 1855 for £35,000. This figure was the sum of the capital employed at the time; and the output was 51,500,000 c.ft. Demand under the Corporation was such that within a year of transference £17,500 had to be spent on new works and £16,500 on new mains. At the end of fifty years of the undertaking, the output was 808,351,000 c.ft., and the capital £531,310. Since the Corporation purchased the undertaking to the present time, over £700,000 has been spent on the works; but this capital expenditure has been reduced to £400,000 by regular payments to sinking fund for the redemption of the debt, and £350,000 surplus profits have been transferred to relief of the rates. The pre-war value of the structures alone was £800,000; so that to-day's value is well over a million sterling, without counting mains, goodwill, &c. The works now supply an area of 15,000 square miles with gas; there are 32,000 consumers (of whom 6000 use prepayment meters); over 200 miles of mains; and more than 40,000 gas appliances are in use for cooking and heating.

The Halifax gas undertaking's Engineer and General Manager is Mr. W. B. M'Lusky, a well-known figure in gas engineering circles, and himself the inventor of several improved appliances which have been of great benefit in the Halifax works. Mr. M'Lusky has the great advantage of having as Committee Chairman Alderman J. H. Waddington, who is the keenest of enthusiasts for gas and everything appertaining to it.

Proposed Combined Gas and Electricity Supply at Retford.—The Retford Town Council have resolved that the price of gas be reduced 4d. per 1000 c.ft., a proportionate allowance to be given to consumers through prepayment meters. The Retford Traders' Association have passed a resolution to support the Town Council in their efforts to provide an electric supply for power and lighting in connection with the Corporation gas-works.

LEAMINGTON PRIORS GAS COMPANY.

Cheaper Gas.

At the 115th Ordinary General Meeting, held at the Leamington Gas-Works, the chair was occupied by Dr. T. W. THURSFIELD, J.P., who said that probably the most interesting part of the Directors' report was that dealing with the price of gas. He wished to emphasize two points—first, that when the Company got their new powers they did not increase the price to anything like the maximum allowed; and, secondly, that owing to reductions in the prices of commodities used in the manufacture and distribution of gas, and the loyal way in which their employees generally had worked, they were able to take off the small increase of 6d. per 1000 c.ft., or 1½d. per therm, when it had been in operation for only six months. After the close of the Michaelmas quarter, they would be charging 10d. per therm, equivalent to 4s. per 1000 c.ft. This showed an increase of 60 p.ct. over the pre-war price of 2s. 6d., and compared favourably with the latest figures published by the Ministry of Labour, giving the increases in the cost of living as about 79 p.ct. above July, 1914. It also compared favourably with the price of gas elsewhere in the Midlands. It was not sufficiently recognized by either their customers or their shareholders how important a part was taken by their sales of coke in keeping down the price of gas. He appealed to all of them to use coke in their own homes, mixing it with coal if their grates would not burn it satisfactorily by itself; and they should get their friends to try it as well. This need not mean forsaking their coal merchant, as any local merchant could supply them at the same price as the Gas Company did. In making this appeal, he was only preaching what he practised himself. He was delighted to see such a representative number of their workpeople with them, and he took the opportunity of thanking them for the loyal way in which he knew that they worked with the General Manager (Mr. R. S. Ramsden) for the benefit of all concerned in the undertaking.

Alderman PURSER, in proposing a hearty vote of thanks to the Directors, staff, and workpeople, remarked that it was very evident that the Chairman was entitled to the best thanks of all the shareholders and gas consumers. The announcement of a full dividend, coupled with a substantial reduction in the price of gas, evidenced the devotion to the direction of affairs which was given by Dr. Thursfield. The inclusion of the workpeople in the vote was no less sincere, for without loyal support from their workers even an efficient directorate and management would be heavily handicapped.

RURAL ELECTRICITY SUPPLY AT HEREFORD.

[From the "Electrical Times."]

Electricity affairs in Hereford are passing through a fog. As we mentioned three months ago, a Special Committee of the Corporation have been appointed to investigate these affairs, the particular point of the investigation being to discover how excess expenditure to the extent of some £11,000 has been incurred. The Special Committee met once, before the holidays interrupted the sessions. A second meeting has just been held, and at this Mr. Dymond (Chairman of the Electricity Committee) gave evidence. Apparently Mr. Kerr (the late City Electrical Engineer) does not desire to attend; neither, it would seem, does Mr. Hill, one of the former Engineers for the rural electricity supply scheme.

Mr. Dymond was first asked about the Breinton transmission line, run by direct labour. The loan for this was £13,213, and 20 miles of cabling and wiring were to be dealt with; not quite 4 miles had been laid. The £13,000 was the first instalment of a larger sum, not definitely for the work in question. Certain of the Committee did not agree that the loan was not for this definite purpose, whereupon Mr. Dymond pointed out that concurrently with this Breinton work other lines also were being dealt with. It was stated by the Mayor that the cost of the Breinton line was something over £7000. Mr. Dymond pointed out that the work was part of a complete scheme, to do which there was only limited time (three years or rather more). At the end of 1920 there was difficulty in obtaining materials, and many were consequently ordered for work not then sanctioned.

The Chairman of the Special Committee then inquired concerning an account for £15,000. The evidence was that £4400 had been paid for laying an underground cable to a certain cider stores. A sum of £15,691 had been paid to the firm, and the amount of the bill was but £4400. The balance had to be accounted for, and the Chairman said he wished to discover whether there was anything charged to the city which should be charged to the rural scheme. In answer to questions, Mr. Dymond explained that the time-limit was due to the relief to be obtained on loan charges up to a certain date. Questions and answers which followed seemed to show that the costing of different sections of the work had not been properly carried out—the costing clerk had been put on other work. Lack of effective supervision also was indicated, which, added to proper accounts not being available, can well be understood to produce muddle. There were other points which arose as to percentages paid on work done, and so forth.

The inquiry was, however, adjourned in order that the Chairman might frame a series of questions for Mr. Dymond to answer. So far he had been mostly speaking from memory only.

Gas Cheaper at Stourbridge.—The Town Council of Stourbridge have approved of a recommendation that, after the reading of the meters for the September quarter, the price of gas for ordinary and power purposes be reduced by 6d. per 1000 c.ft.

Buxton Price Reduction.—The Buxton Gas Committee have decided to reduce the price of gas 4d. per 1000 c.ft. after the September quarter meter readings. The charge will then be for lighting 4s. 2d. per 1000 c.ft., for heating and cooking by separate meter 3s. 11d., and for engines 3s. 8d. Slot-meter cash discounts for the December quarter will be increased to 1½d. in the shilling.

ANNUAL REPORT AT SOUTHPORT.

The annual report of Mr. John Bond, Engineer and Manager of the Southport Corporation Gas Department, for the year ended March 31, states that the increase in the consumption of gas amounted to 25 318,000 c.ft., or 4·26 p.ct., as compared with last year's figures. The average price received for gas sold was 4s. 11·29d. per 1000 c.ft.

The gross profit for the year amounts to £6603, and bringing forward last year's credit balance of £236 makes a total of £6839. After paying £11,261 to interest and sinking fund there is a debit balance of £4422. The capital account (total amount expended) now stands at £326,558, and the capital outstanding, after deducting payments from time to time through the sinking fund, at £160,316. In 1904 the capital bearing interest stood at £197,950, when the output of gas was 441 million c.ft. Now the outstanding capital is £160,316, and the output of gas 619 468,200 c.ft. This shows an increase in gas sold since 1904 of 40 p.ct., and a decrease in the capital of 19 p.ct. Calculating the capital per 1000 c.ft. of gas sold, shows that in 1904 the capital outstanding was 8s. 11·6d., and in 1922 5s. 2 11d. per 1000 c ft. These figures indicate that the Gas Committee have been careful in keeping the capital account as low as possible, and the undertaking is at the present time financially sound in every respect.

The department were put to considerable expense and inconvenience through the three months' coal strike, and during that period the Gas Committee supplied 129 million c ft. of gas to the consumers, and 873 tons of coal in small quantities for domestic use, and to the various coal merchants, to relieve as far as possible cases of distress. The department were able to maintain a full supply of coke to all bakehouses, and disposed of 1824 tons of this material, and 1104 tons of coke breeze for general use. Every effort was made to maintain an adequate supply of gas. All gas supplied to the consumers during the strike was sold at 2s. 4d. per 1000 c.ft., less than cost price, and in this way the department were put to an extra expenditure of £16,000.

The total quantity of gas accounted for was 626.823,300 c.ft. The total number of meters in use at the end of the year was 20,387, being an increase on the previous year of 122.

Councillor R. WRIGHT (the Chairman of the Gas Committee), when introducing the report to the Southport Town Council, said that 187 new gas-fires had been fixed, and he was strongly of opinion that, when the older generation of doctors had become converted to the utility and harmlessness of gas-fires in bedrooms and sitting rooms, as the younger doctors had been, there would be further substantial increases in the numbers installed. It was something very unusual for the Southport Gas Estate to have a deficit. The department in the past had been the milch cow to draw upon for the relief of the rates. It was to be hoped that never again would the gas-works be asked to contribute to do this. Should there be a surplus on the year's working in future, he trusted this would be returned by means of a reduced price of gas to those who had contributed to make the surplus. Last year the department handed over no less a sum than £4000 towards the relief of the rates; and this year, in the accounts before them, this sum was debited. Had it not been so, the department would have balanced itself. The gas-works had thus done well during the past year, notwithstanding a reduction of 1s. per 1000 c.ft. in price. A most pleasing feature of the report was that the capital outstanding, or the book value of the estate, was now only £160,316; more than half of the authorized capital having been written off. Mr. Bond, throughout the trying year, had shown great ability and foresight, and it was largely due to his business acumen that such a good report could be presented.

STOCKPORT GAS ACCOUNTS.

Mr. S. Meunier, the Engineer and Manager, has presented to the Gas Committe of the County Borough of Stockport his report on the working of the undertaking for the year to March last. He says that the financial results show a decided improvement; there being a net profit of £885, as against a loss of £27,605 for the previous twelve months.

This result is the more encouraging when the losses brought about by the coal strike are taken into account. The sales of gas alone were reduced by 49 million c.ft., and to the reduced revenue in consequence has to be added loss on coke (the sale of which had to be stopped from an early period, it being required for the carburetted water-gas plant), reduced output of tar and liquor, and the purchase at high prices of coal—mainly American—of which 6130 tons were bought at a total cost of £22,388, and an average price of 73s. 0½d. per ton. This caused the average price for the whole year to be 39s. 5d. per ton, against an average price paid in the preceding year of only 32s. 4d. Also 1951 tons of furnace coke had to be obtained at a cost of £8334, and an average price of 85s. 5d. per ton, after the stock of gas coke had been used-up in the water-gas plant, to enable this to be kept going. The total cost of this unfortunate strike was estimated to be at least £35,000. For the whole period of the stoppage the department were able to maintain a satisfactory, though restricted, supply of gas during the essential hours of the day.

The first section of the new installation of vertical retorts was put to work on July 6, 1921, being followed shortly after by the second section. It has worked very satisfactorily and economically, as is shown by the increase in the make of gas per ton from 9385 c.ft. in 1920-21 to 15 841 c.ft. in 1921-22, though during the winter a portion of the old plant was in use; in that of coke for sale from 10 cwt. 1 qr. 13 lbs. to 11 cwt. 2 qrs. 14 lbs.; in tar from 1 cwt. 0 qr. 7 lbs. to 1 cwt. 2 qrs. 7 lbs.; and in sulphate of ammonia from 20 lbs to 25 lbs.

There has been a very heavy fall in the value of residuals; the revenue from coke being down £19,657, tar £16,583, and sulphate of ammonia £6782. Oxide of iron (which was practically unsaleable) and sundries are down £2924; and it having been found advisable to leave the benzole in the gas, the plant has not been working, and there is a further drop in revenue from this source of £2770. The total amounts to £48.717.

On the expenditure side, the cost of coal is reduced by £19,993, notwithstanding the increase in the average price referred to above, and carriage by £2234. Stokers' wages are less by £16,719, materials £3965, and purification £905, with an additional item for purification of effluent from the sulphate of ammonia plant of £204, or a total saving of £43,535. The carburetted water-gas plant was closed-down for practically three months of the year; and this, with a reduction in the price and quantity of oil used, accounted for a further saving of £21 345 These are the larger items, and substantially account for the total of £30,668 carried to profit and loss account, of which £29.782 has been required for revenue contribution to capital, sinking fund, and interest on debt (being an increase of £11,120, chiefly due to charges on the new plant), leaving the profit at £885.

Though there has been great difficulty in getting repairs to meters quickly carried out, the progress that has been made is reflected in the item for unaccounted-for gas, which is reduced from 9·42 p.ct. in 1920-21 to 6 91 p.ct. It is hoped that this improvement will continue as meters are gradually put in order.

There was a reduction in price of 2d. per 1000 c.ft. as from the end of the March quarter. Meter-rents, equal to about a further 2d. per 1000 c.ft., were abolished, and the differential discount for gas used for industrial purposes re-introduced. But it is suggested that it would be advisable to make further concessions at the earliest possible moment, not only as a step to assist the restoration of trade, but also as a means to avert threatened competition in various processes where gas is generally employed.

A GAS-FIRE LECTURE AT SWANSEA.

A most interesting lantern lecture was delivered, under the auspices of the Swansea Gas Company on Wednesday to the Company's staff and employees.

The chair was taken by Mr. W. H. Johns, the Engineer and Manager of the Gas Company; and he was supported by Mr. W. C. Jackson, the Engineer and Manager of the Neath Gas Company, and Mr. Sutcliffe of the Gowerton Gas Company, both of whom were accompanied by members of their staff. Several officials of the Swansea Corporation were present. Mr. Frank Harvey, of the Radiation Technical Staff, dealt in detail with gas-fire construction, and the necessity of care in fixing. The advantages of the modern Radiation gas-grate were dealt with very fully, particularly the marked advance which has been made in the provision of effective ventilation. A fine series of lantern slides was shown. After the lecture a discussion took place.

Examples of burners, taps, &c., were demonstrated on the platform, and methods of adjustment explained, with particular reference to the Radiation patent gas injector. It was shown that best results were obtained with the latter under all conditions of pressure, and that it provides for a gas connection on either side of the grate, a reversible brass plug being supplied for closing the unused inlet.

INTEREST RATES ON LOCAL LOANS.

The "London Gazette" dated Oct. 3 contained a notice by the Treasury to the effect that, on loans advanced from the Local Loans Fund, on and after Oct. 2, 1922, there shall be chargeable, in lieu of the rates fixed by the Treasury Minute of April 1, 1922, the following rates of interest, save as regards any loans already agreed to be advanced at rates of interest lower than 5 p.ct. per annum, in respect of which the rate of interest will be determined by the lending authority having regard to the circumstances of each individual case, but shall not exceed the appropriate rate now prescribed:

	Rate of Interest P.Ct.
(1) Loans to local authorities for any purposes of the Small Holdings Acts and the Allotments Acts, 1908 to 1922:	
Any period	5
(2) Other loans secured on local rates:	
Not exceeding 30 years	5
,, ,, 50 ,,	5¼
(3) Loans not secured on local rates:	
(a) Loans under the Harbour and Passing Tolls Act, 1861:	
(i) With collateral security—	
Not exceeding 30 years	5
,, ,, 50 ,,	5¼
(ii) Without collateral security—	
Not exceeding 30 years	5¼
,, ,, 50 ,,	5½
(b) Other loans not secured on local rates (except loans to Territorial Associations, which, under section 6 of the Public Works Loans Act, 1908, bear interest at the rate prescribed for loans on the security of local rates):	
Not exceeding 30 years	5¼
,, ,, 50 ,,	5½

Rates of interest on loans in respect of subsidized housing schemes are also set forth.

Stretford Gas Undertaking Transfer.—Manchester has formally handed over to the Stretford District Joint Gas Board the Stretford gas undertaking. In the Manchester City Council, Alderman Walker asked for the total parliamentary costs in connection with the transfer. He wanted to know how much Stretford had to pay towards the costs, seeing that they had obtained the gas undertaking. Sir Edward Holt (Chairman of the Parliamentary Committee) said that the Parliamentary Bills cost £12.000, of which the Manchester Gas Committee had to pay approximately £8000 and the Corporation £4000. It had to be remembered that there were thirteen items in the Bills. Pressed by members of the Council, Sir Edward Holt said the total costs were paid by Manchester, Stretford paying nothing.

LECTURE ON GAS HEATING AT DERBY.

The Derby Gas Light and Coke Company are arranging a number of lectures to cover many useful subjects appertaining to the use of gas and gas appliances, and one of the series was delivered last Thursday by Mr. Frank Harvey, of the Radiation Technical Staff. The lecture was attended by over 200 of the Company's staff and employees, and was a great success from all points of view.

Mr. Harvey first discussed the replacing of the old and well-established coal-fire by gas-fires, remarking that very few of the general public realized that this was of national importance. The objections to the coal fire might be summarized as waste of coal and damage done by smoke, both to the health of the nation and to public property. Regarding the waste of coal, it had been estimated that out of 40 million tons burned annually in domestic grates from 20 to 30 million tons were wasted by the open coal-fire. The direct burning of coal in that way involved the loss of valuable bye-products which were obtainable when the fuel was treated properly and subjected to distillation prior to combustion. With regard to the damage done by smoke, it was not generally realized how much of this was due to the domestic fire grate. Because certain sections of the country in which industries were congregated were notoriously dirty, it was often assumed that the main sinner was the factory chimney. Actually three-quarters of the total air pollution by smoke was due to the household chimney.

Speaking of the gas fire as an alternative, he pointed out that the main essentials of a satisfactory fire were that it must provide the bulk of the heat as radiant heat; it must be hygienic, silent, and pleasing in appearance. By means of slides and demonstrations he showed how the objectionable "roaring" of the gas-fire had been eliminated in the newest type—a tremendous advance on the fires of a decade ago; and how the important factor of ventilation had been studied to remove stuffiness, which had often caused complaint. Though the cost of the actual fuel was slightly greater for gas than for coal, this was more than offset by the labour saved in many directions, and by the fact that the use of gas introduced that easy control of the heating medium which permitted of perfect economy.

Mr. Harvey's technical details were of particular interest to his audience; and in thanking him, Councillor J. Ferguson Bell said for a number of years gas companies had the field to themselves, but with changing times they also had to change. Though electricity was now a competitor, efficient work by the 400 employees would continue to keep the Gas Company as successful as in the past hundred years.

Those taking part in the discussion included Mr. J. P. M'Crae, and Mr. H. Clark, Superintendent of the Distributing Department.

A Reduction at Knutsford.—The Knutsford Light and Water Company, Ltd., have decided to reduce the price of gas by the equivalent of 4d. per 1000 c.ft.

TRADE NOTES.

Stanton-Hume Concrete Pipes.

A brochure recently issued by the Stanton Ironworks Company, Ltd., near Nottingham, gives interesting information regarding Stanton-Hume concrete pipes, together with sketches illustrating the various processes involved. In the first place, the sand used is automatically and mechanically washed and dried, and conveyed direct to covered-in storage bunkers, so that no foreign matter can possibly be included. The revolving moulds are fed with concrete mixture, which automatically spreads itself evenly over the inner surface. The centrifugal action expels all the excess air and water, which results in an absence of voids. Considerable attention has been given to the maturing of these pipes, which are first passed through chambers containing a saturated atmosphere, and are then placed in the stockyard for several weeks. Though they are manufactured without reinforcement for low-pressure work, higher pressures demand the inclusion of carefully selected and tested steel wire. Arrangements have now been completed for the manufacture of unreinforced special pipes, centrifugally spun and possessing all the outstanding advantages of the Stanton-Hume straight concrete pipe.

Water-Gas Plants for Small Works.

There is to hand from British Furnaces, Ltd., of No. 7, Grosvenor Gardens, Westminster, a copy of their latest Bulletin on the subject of water-gas plants for small gas-works. In this it is pointed out that large gas undertakings have for many years appreciated the advantages to be gained by the combination of retort-house and water gas practice in separate units, and that by the adoption of the "B.F.L." system of blue water gas manufacture, small works now have the facilities which were previously only available to the bigger undertakings. The advantages accruing from the manufacture of blue water gas are set forth, and it is stated that the capital cost per therm made on a small blue water-gas plant is about one-third that on a modern small coal-gas plant. British Furnaces, Ltd., build and supply (under guarantee) water-gas plants of patented design which have given complete satisfaction in over 170 works in different parts of the world, and the chief feature of which is simplicity of design and operation. The Company have also the sole manufacturing rights of the American surface combustion system and of the Roberts-Booth patent recuperative furnace.

Lower Price at Northwich.—The Northwich Gas Company announce a reduction in the price of gas as from the meter readings for the September quarter. The new charges will be: For lighting purposes, 5s. 9d. per 1000 c.ft.; for cooking and heating, 5s. 3d.; and for power, 5s. For gas supplied through slot meters 14 c.ft. will now be given for a penny.

CARBON DI-OXIDE RECORDED BY ACTUAL MEASUREMENT.

THE S.A.W. CO_2 RECORDER

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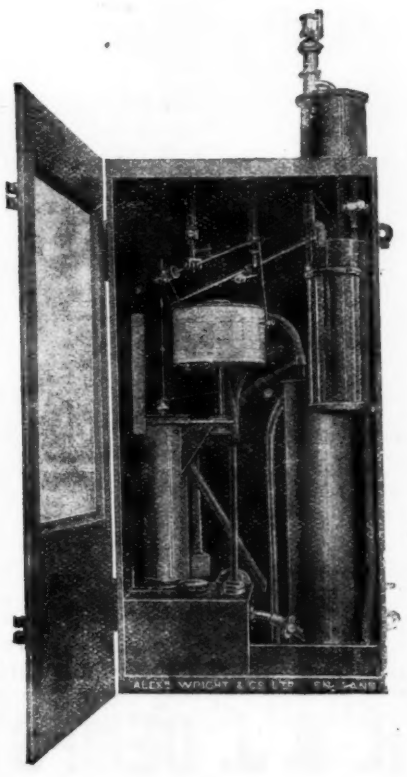
SIMMANCE, ABADY & WOOD.

An actual measurement, not empirical. No electricity and no osmotic pressure, therefore unaffected by **gravity** or **humidity.**



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CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

Oct. 9.

The average values for gas-works products during last week were: Gas-works coal tar, 52s. 6d. to 57s. 6d. Pitch, East Coast, 92s. 6d. to 95s. f.o.b. West Coast—Manchester, 87s. 6d. to 90s.; Liverpool, 88s. 6d to 91s. 6d.; Clyde, 90s. 6d. to 92s. 6d. Benzole 90 p.ct. North, 1s. 10d. to 1s. 11d.; crude 65 p.ct. at 120° C., 1s. 1½d. to 1s. 3d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 10d. to 1s. 11d. Toluole, naked, North, 2s. to 2s. 3d. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9½d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 2s. to 2s. 1d. Creosote, in bulk, North, liquid, 6½d. to 6⅝d.; salty, 5½d. to 5⅝d. Scotland, 4¾d. to 5d. Heavy oils, in bulk, North, 6½d. to 6¼d. Carbolic acid, 60 p.ct., 2s. to 2s. 1d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

The average price realized in the Manchester district for the sale of tar, according to the sliding-scale, for the month of August was £2 19s. 5·65d. per ton.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

The market in tar products remains steady, with an advance in one or two directions. Benzole is slightly dearer. One would have imagined that the fall in the price of petrol would have had the opposite effect; and it is most difficult to see how benzole can remain at 2s. per gallon if petrol is plentiful at 1s. 10d. On the other hand, it has to be admitted that a gallon of benzole will do more work than a gallon of petrol. Solvent naphtha has been weak at 1s. 9d. to 1s. 10d. per gallon. Carbolic acid is still a firm market, and 7d. per lb. is being mentioned for crystals. Crude 60's is much more active owing to foreign inquiry; but the price does not seem to get beyond 2s. per gallon. Cresylic acid is still unsettled on account of the new American tariff; but there is very little change in quotations. Pitch is the most interesting product at the moment; and the view is current that, towards the end of the year, there will be a shortage in supplies. This, coupled with a still steady demand from the Continent, is producing a very strong feeling, and up to 97s. 6d. per ton f.o.b. has been paid on the East Coast. Creosote remains scarce. For prompt delivery, 6d. per gallon is quoted, and sellers anticipate a further advance. There is not much change in intermediate products; but there is more inclination to place business for forward delivery. Prices remain as last quoted.

Sulphate of Ammonia.

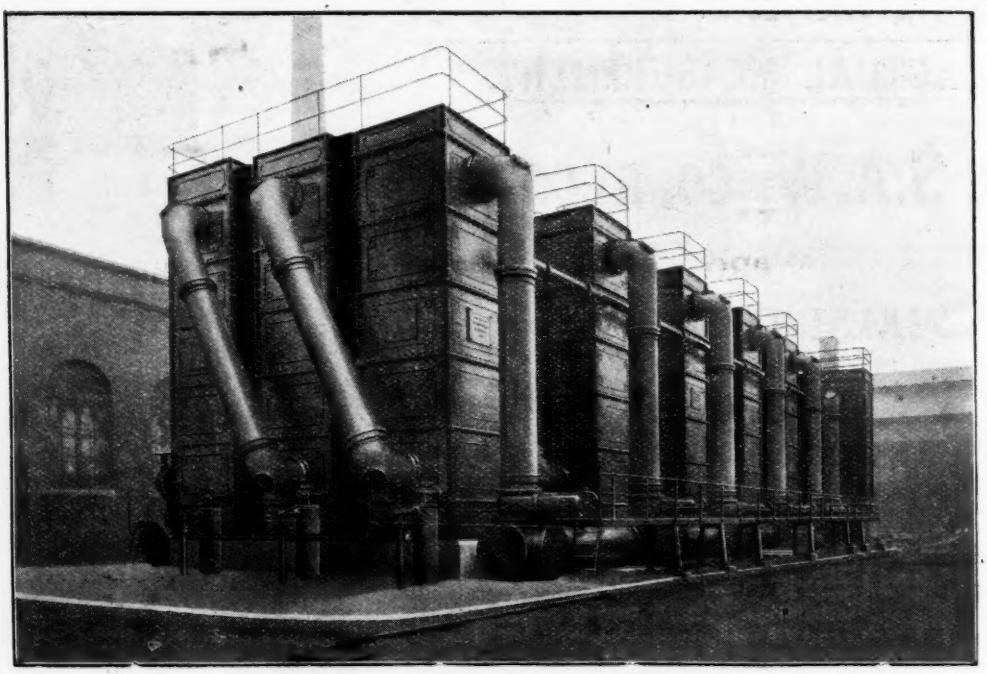
The British Sulphate of Ammonia Federation, Ltd., announce that they still have limited quantities of sulphate of ammonia available for October delivery; but they have raised the price of November and December 1922 deliveries by 5s. per ton. These deliveries are now quoted at £16 13s. per ton for neutral quality 25¾ p.ct. ammonia, and £15 10s. per ton for ordinary quality 25¼ p.ct. ammonia. Attention has been drawn once again to the fact that owing to the coal strike in America the world's supply of sulphate of ammonia will probably be curtailed to an even greater extent than was thought likely two months ago. Prices are also higher for export at £18 and £19 per ton; and in view of the world shortage, a further advance in export quotations is likely.

Further Price Reduction at Chorley.—Alderman Heald referred, in the Chorley Town Council, to the resolution of the Gas Committee to bring down the price of gas a further 6d. per 1000 c.ft., making a total reduction of 10d. since the end of the financial year. He said this additional concession had been rendered possible by lower coal prices and wages. The Committee had not overlooked the provision of sundry allowances for improvements and renewals still necessary at the works.

Cheaper Gas for Edinburgh.—In the "JOURNAL" for Sept. 27, it was stated that the Edinburgh Gas Committee had agreed to recommend the Town Council to reduce the price of gas this month by 4d. per 1000 c.ft., making the charge 4s. 3d. It should have been said that the reduction will make the price 4s. 2d. per 1000 c.ft. Thus the charge in Edinburgh will be 1s. 6d. per 1000 c.ft. less than it was in December last, when the price stood at 5s. 8d. per 1000 c.ft. This is a very substantial benefit to the consumers.

Luton Gas Company.—The 129th ordinary meeting of the Company was presided over by Mr. R. S. Tomson (the Chairman), who submitted the report and statement of accounts, remarking that he was pleased the latter was very much better than they had had lately. The cost of coal was £8000 less. In spite of the fall in the price of residuals, the Company had been able to reduce the price of gas from 4s. 1d. to 3s. 6d. per 1000 c.ft. This would enable them to pay a better dividend. They hoped to make a further reduction in price, but could not make any promise as to this at the present time. The quantity of gas sold showed a decrease, as compared with the half year ended June, 1921, of 8,575,000 c.ft., which was accounted for by the temporary closing of some of the works in the town. The balance-sheet and report were adopted, and dividends for the half year ended June 30 at the rates of 2 and 2½ p.ct. were declared on the "B" and "C" preference shares respectively, and on the "A," "D," and "F" ordinary shares at the rates authorized by the Luton Gas (Charges) Order, 1922. A vote of thanks was passed to the Chairman and Directors for their services, and also to Mr. William Phillips (the Secretary and Manager) and his staff.

LATEST IMPROVEMENTS—"BEARSCOT" TUBES—MADE IN ALL SIZES.



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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 4.]

Nos. 25,806 to 26,475.

AKTIEBOLAGET LJUNGSTRÖMS ANGTURBIN. — "Regenerative pre-heaters for air and gas." No. 25,894.

ALLEN, W.—"Tar-well." No. 26,115.

COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ.—"Directly measuring coefficients of self-induction and capacities." No. 26,252.

GIBSON, R. K.—"Diaphragm for gas-meters." No. 26,421.

HAERLE, H.—"Turbine blowers, compressors, and exhausters." No. 26,341.

HARRINGTON, O. A.—"Couplings for pipes, &c." No. 26,334.

HERRING, E.—"Connector joints for pipes." No. 26,318.

JACKSON, C. A.—"Apparatus for operation of valves, &c." No. 26,338.

MAJOR, P. F. E.—"Coin-released meters, &c." No. 26,291.

MILES, G. H.—See Major, P. F. E. No. 26,291.

MORGAN, W. H.—"Geyser burner-box." No. 25,942.

NEWELL, O. A.—"Gas-economizer." No. 25,848.

NOAKES, V.—See Morgan, W. H. No. 25,942.

OAKLEY, P.—"Gas-fires, &c." No. 26,399.

PICCARD, W.—"Production of combustible gases." Nos. 25,835, 25,836 25,837.

POWERS, H.—"Gas-generators." No. 26,016.

REAVELL, W., and REAVELL & CO., LTD.—See Haerle, H. No. 26,341.

ROCHELLE, W. A.—See Newell, O. A. No. 25,848.

SMITH, C. C.—See Major, P. F. E. No. 26,291.

STOVES, LTD.—See Oakley, P. No. 26,399.

THOMPSON, A.—"Domestic gas pans or boilers." No. 26,165.

UMPLEBY, F.—See Powers, H. No. 26,016.

Blackpool Electric Light Failure.—A failure of the electric light supply over a considerable area caused much inconvenience to business premises in Blackpool last Saturday week. During heavy rain shortly after 8 o'clock in the evening, the light was cut off through a fire, and about an hour elapsed before the damage was made good. Fortunately the street lighting was not affected, nor were the tram services.

Reduction in Price at Ulverston.—The Ulverston Urban District Council have agreed to reduce the price of gas 6d. per 1000 c.ft. Mr. Court stated that there would be a decrease in the cost of coal of £1900, and the 6d. off the price of gas was estimated at £950. It was arranged not to alter the slot-meters at present, because of the cost and the possibility of another early reduction in the charge for gas, but to allow a rebate to consumers when the collections are made.

Alford Gas Supply.—Complaints were forthcoming at the last meeting of the Alford District Council as to the indifferent supply of gas to this Lincolnshire town; it being urged that dissatisfaction was especially justified in view of the present heavy cost of 7s. 4d. per 1000 c.ft. The Council decided to make representations on the matter to Mayor Hadfield, the local Director of the Company.

Welshpool Gas Company.—An extraordinary meeting of the shareholders of the Welshpool Gas Company, followed by the annual general meeting, was held recently, when the Chairman (the Earl of Powis) presided over a full attendance. At the extraordinary meeting a resolution was carried that the Company should be registered under the Companies Consolidation Act, 1908, so as to enable the Directors to pursue a more progressive policy. The Directors' report for the year ended June 30 stated that the accounts showed a balance of £961, out of which the Directors recommended the payment of a dividend of 6 p.ct. (subject to tax), which would absorb £514, leaving a balance of £447 to be carried forward to next year's account. The Directors regretted to report the death of Alderman Wyke, a member of the Board for the past eight years. Dr. Thomas, seconding the adoption of the report, said in July, 1921, owing to the late coal strike, the Company were buying coal at the rate of 73s. 11d. per ton. It was a Midland coal of very inferior quality, and totally unsuited to their retorts—making gas to the extent of 6000 c.ft. per ton, as against 12,000 c.ft. from the North Wales coal they used to get. By September they were able to secure North Wales coal at 41s. 6d. per ton. At the beginning of the financial year the price of gas was 10s. per 1000 c.ft. They reduced it to 9s. 2d., then to 8s. 4d., and this month to 7s. 6d.

A Salary Question at Llandudno.—The question of the Gas Manager's salary was again discussed at the meeting of the Llandudno Urban District Council last week. At a previous meeting the Gas Committee recommended a reduction by 5 p.ct., in accordance with the cut made in all the officials' salaries. The matter was referred back, and at this meeting the Committee reported that, after giving the matter full consideration and having regard to all the circumstances, they had decided to recommend that no reduction should be made. Mr. Wm. Thomas (the Chairman of the Gas Committee) said this decision was arrived at by a small majority. The decision to raise the other officials' salaries from the highest to the lowest was made on April 22, 1920, and Mr. H. Duxbury did not commence his duties until May 4 of that year, so he did not participate in the then increase given. It was mentioned at the time of the appointment that an increase would be made later on, and this was done. Mr. Sarson said that Mr. Duxbury had brought the gas-works to the present state of efficiency, and the time was not opportune for decreasing his salary. Mr. Jones said that there was a principle involved in the matter. The Manager was appointed at a certain salary, and was told he would get an increase if the results justified it. No mention of a decrease was made to him. If they had efficiency they must pay for it. It was decided, by eleven votes to ten, to adopt the Committee's recommendation.

BRADDOCK'S RETORT-HOUSE GOVERNORS

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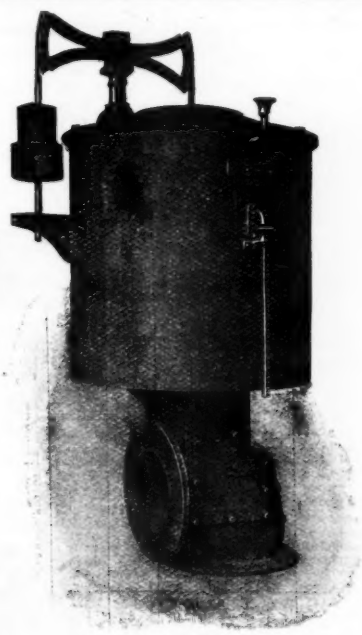
Many repeat orders have been received.

Braddock's New Patent Retort-House Governor is a further improvement and is especially desirable for use with Vertical Retorts.



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Braddock's New Patent Enclosed Retort-House Governor.
Latest Type.

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STOCK MARKET REPORT.

THE week opened very quietly—the Jewish holiday accounting for many absentees; but the tone showed considerable improvement. Markets in general were firmer, and so they remained until near the close. Home Government issues and Indian and Colonial were in demand. Home Rails, Canadian, and Argentine were firm.

The Foreign Market revived; French, Argentine, Brazilian, and Chinese being prominent. But on Friday, misgivings as to the Near East returned, and many advances were lost. The big four marked: Consols 56⅝-57¼, War Loan 99$\frac{15}{16}$-100$\frac{7}{32}$, Funding 83½-84¼, Victory 87$\frac{7}{16}$-88$\frac{3}{8}$.

Business in the Gas Market was more active, the three largest Companies being conspicuous. Movements were not uniform. The London Companies were firm, and Gas Light ordinary rose 1. In the Suburban and Provincial group, Alliance and Dublin were marked *ex div.* at about level figures, and Wandsworth "C" rose 2. Croydons are restored to the list under their new titles, and Ilfords disappear from it, being merged in the Gas Light and Coke. In the Continentals, Union preference fell 5, Imperial 2, and European ¼. Elsewhere, Primitivas were $\frac{1}{16}$ to ⅛ lower.

The following transactions in gas during the week were recorded: On Monday, Brentford "B" 102½ European 10½, Gas Light ordinary 94, 94¼ 94½, Imperial Continental 157, 157½, 158, 161½, ditto debenture 72½, Liverpool 89⅝, 90¼, 90½, Primitiva 12s. 6d., ditto preference 35s., 37s. 6d., South Metropolitan 93¾, 94¼, Wandsworth Wimbledon, 99¾, 100, Wolverhampton 10 p.ct. 124⅜ 124$\frac{13}{16}$. On Tuesday, Brentford "B" 101, Brighton and Hove original 168½, Cape Town preference 6⅞, Commercial 4 p.ct. 94½, 95, ditto 3½ p.ct. 94, ditto debenture 57, Gas Light ordinary 93⅞, 94, 94¼, 94⅜, ditto preference 78, Imperial Continental 156¾, 158, 159, ditto debenture 72, Primitiva preference 32s. 6d., 35s., South Metropolitan 93½, 93⅝, 94, 94½, ditto 3 p.ct. debenture 62, Tottenham "B" 100, Wandsworth Wimbledon 99, Southgate District 5 p.ct. 89½, 90, Swansea 7 p.ct. preference 103½, Swindon United 4½ p.ct. preference 6, 6$\frac{1}{16}$, 6⅛, Woking District 5 p.ct. preference "C" 71, 71½. On Wednesday, Alliance and Dublin 64⅛, 65, Commercial 4 p.ct. 94, European 10$\frac{1}{16}$, Gas Light ordinary 94, 94¼, 94½ 94⅝, 94¾, 94⅞, ditto maximum 61⅝, ditto preference, 79, 79½, ditto debenture, 62⅝, Imperial Continental 158⅜, 159, ditto debenture 73 Oriental 96, Primitiva preference 35s., South Metropolitan 93⅝ 94⅛, ditto 3 p.ct. debenture 63, Tottenham "B" 98, Wandsworth New 90, ditto Wimbledon 99 100⅛, Brentford 6 p.ct. mortgage 98. On Thursday, Commercial 4 p.ct. 95, Continental Union preference 50, European 10⅜, 10⅛, Gas Light ordinary 93⅞, 94, 94⅛ 94¼, 94⅝, 94⅞, ditto maximum 62½ 62⅞ ditto preference 78, 78¼ 78½, 79⅛, ditto debenture 62⅝, Hastings and St. Leonards 5 p.ct. 99, 99½, 100, ditto 3½ p.ct. 77, 77½, Imperial Continental 159, Newcastle 76, Primitiva preference 32s. 6d., South Metropolitan 93½, 94¼, 94⅜, Wandsworth New 91, Northampton 5 p.ct. 73. On Friday, Commercial 4 p.ct. 94⅝, ditto 3½ p.ct. 94¼, 95⅛, 95⅝, ditto debenture 56, Continental Union preference 53, Croydon sliding scale 82½, ditto maximum dividend 80, European 10⅜, Gas Light ordinary 94¼, 94⅛ 94⅝, 94⅞, 94⅞, 95, 95¼, 95½, ditto maximum 62⅝, ditto preference 78, ditto debenture 61½, Imperial Continental 157, 159, 160, Newcastle debenture 67½, South Metropolitan 93½, 94, 94¼, 94½, ditto 6½ p.ct. debenture 105½, Leatherhead 5 p.ct. ordinary 7.

In the Money Market, the position was one of extreme ease, available supplies being very considerably in excess of all requirements, and this became the more apparent as the week went on. Discount, on the other hand, after an easy progress hardened slightly before the close. Silver fell ¼d. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.cc.					
182,049	Stk.	Aug. 24	4	4%	Aldershot 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	60—63*	64½—65
374,000	,,	July 13	4	4%	Do. 4 p.c. Deb.	76—79	60—65	...
280,000	5	May 18	7½	4/-	Bombay, Ltd.	5⅞—6⅞	4⅞—5⅛	...
100,000	5	Aug. 10	16	7½%	Bournemouth Gas and Water — 5 p.c.	..	11—12	...
383,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	10½—11½	...
115,000	10	,,	6	6%	Bournemouth Gas and Water — Pref. 6 p.c.	13⅛—14	8—9	...
162,065	—	June 29	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	..	73—78	...
992,045	Stk.	July 27	14	6t/-	Brentford A Consolid.	261—266	98—103	...
734,920	,,	,,	11	6t/3	Do. B New	204—209	98—103	101—102½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	82—87	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb.	91—93	75—80	...
214,775	,,	Aug 24	11	11½%	Brighton & Hove Orig.	208—213	165—170	168½
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	120—125	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	..	...
530,000	20	Oct. 5	12½	22/5	British	44—45	30—32*	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	53—58	...
100,000	10	June 1	—	7%	Cape Town & Dis., Ltd.	1½—2½	6¾—7½	...
100,000	10	Apl. 27	—	4½%	Do. 4½ p.c. Pref.	4—6	6¾—7½	6¾
100,000	Stk.	June 29	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	73—78	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	93—98	91—95
560,000	,,	,,	5½	55/-	Do. 3½ p.c. do.	103—105	93—98	94—95¼
475,000	,,	June 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	56—57
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	29—34	..
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	50—55	50—53
51,600	,,	Feb. 23	15	15%	Croydon A 10 p.c.	..	..	..
278,400	—	,,	12	12%	Do. B and C 7 p.c.	..	..	
660,000		Sept 1	—	6%	Do sliding scale.	..	85—89	82½
284,975		,,	—	5%	Do max div.	..	78—82	80
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	80	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	65	...
1,002,180	10	July 13	10	5/0	European, Ltd.	17½—18	10½—11⅛	10⅜—10$\frac{5}{16}$
16,298,975	Stk.	July 27	4/17/4	52/-	Gas Light and Coke — 4 p.c. Ord.	98—102	94—96	93⅛—95⅛
2,600,000	,,	,,	3½	35/-	Gas Light and Coke — 3½ p.c. max.	76—79	61—64	61⅛—62½
4,062,235	,,	,,	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	78—82	78—79⅛
4,674,850	,,	June 15	3	3%	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	61—64	61⅛—62½
130,000	,,	Dec. 11	10	10%	Gas Light and Coke — 10 p.c. Bonds	..	..	...
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c.	..	95—100	99—100
258,740	,,	,,	3½	50/3½	Do. 3½ p.c.	87—89	75—78	77—77½
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16¾	6—7	...
86,600	Stk.	Aug. 24	9	9½%	Hornsey 7 p.c.	..	127—132	...
1,976,000	,,	May 18	9	10%	Imperial Continental	150—160	155—160	156½—161½
404,800	,,	Aug. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	70—75	72—73
235,242	,,	July 27	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. A.	211—213	..	89½—90½
					Liverpool 5 p.c. Ord. B.	146—148	..	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	...
165,736	,,	Aug. 10	7/5/6	87/3	Maidstone 5 p.c.	..	87—92	...
63,480	,,	June 29	—	3%	Do. 3 p.c. Deb	..	54—59	...
75,000	5	,,	6	6%	Malta & Mediterranean	4⅛—4⅜	3⅛—3⅜	...
250,000	100	Oct. 2	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	83—96*	...
541,920	Stk.	June 1	4	4%	Monte Video, Ltd.	11⅛—12	62—67	...
1,875,892	,,	July 27	4½	4½%	Newcastle & Gatsh'dCon.	98½—99½	75—77	76
529,705	,,	June 29	3½	3½%	Do. 3½ p.c. Deb.	82—83	67—6/	67½
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	12⅜—13	...
55,940	10	Aug. 24	7/14/0	7/8⅜	,, ,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	May 18	8	8%	Oriental, Ltd.	117—122	92—97	96
60,000	5	—	10	—	Ottoman, Ltd.	7⅛—7⅜	2—3	...
188,120	Stk.	June 29	—	6/3/9%	Plym'th & Stonh'se 5 p.c.	..	93—98	...
60,000	50	Aug. 24	13	65/-	Portsea Island, B	128—131	100—105	...
100,000	50	,,	12	60/-	Do. C	118—121	85—90	...
249,980	5	—	8	—	Primitiva Ord.	5⅛—6	$\frac{15}{16}$—1$\frac{3}{16}$	11/6—12/6
499,960	5	—	5	—	Do. 5 p.c. Pre.	4⅛—5	1⅛—1⅜	32/6—37/6
521,600	100	June 1	4	4%	Do. 4 p.c. Deb.	91—93	68—73	...
600,000	Stk.	July 27	4	4%	Do. ,, ,, 1911	..	55—60	...
346,198	,,	June 29	4	4%	River Plate 4 p.c. Deb.	85—87	53—58	...
150,000	10	Sept. 21	6	6/-	San Paulo 6 p.c. Pref.	10½—11	5⅛—6	...
125,000	50	July 3	5	5%	San Paulo 5 p.c. Deb.	47—49	35—38	...
135,000	Stk.	Aug. 24	10	5%	Sheffield A	223—224	95—97	...
209,984	,,	,,	10	5%	Do. B	222—224	95—97	...
523,500	,,	,,	10	5%	Do. C	220—222	95—97	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	June 29	9	7½%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 27	5/4/0	5%	South Met. Ord.	111—113	93—96	93⅛—94⅛
250,000	,,	July 13	—	5%	Do. Red. Pref.	..	94—96	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	61—64	62—63
224,820	,,	Aug. 24	8½	8½%	South Shields Con. Stk.	157—159	106—108	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	97—100	...
368,837	,,	June 15	5	5%	Do. 5 p.c. Deb. Stk.	116—118	95—100	...
647,740	,,	May 18	5	5%	Southampton Ord.	99—102	75—80	...
121,275	,,	June 29	4	4%	Do. 4 p.c. Deb. Stk.	..	63—68	...
120,000	,,	July 27	—	7½%	Tottenham District A 5 p.c.	135—138	110—115	...
782,275	,,	,,	6	6%	Tottenham District B 3½ p.c.	115—117	97—102	98—100
181,255	,,	June 15	4	4%	Tottenham District 4 p.c. Deb.	87—89	75—80	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	⅛—⅜	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	20—30	...
236,476	Stk.	Aug 24	5	2½%	Tynemouth 5 p.c. max.	108½—109	73—75	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	July 27	8½	72/6	Wandsworth A 5 p.c.	151—156	111—115	...
455,636	,,	,,	6½	57/6	Do. B 3½ p.c.	129—134	95—100	...
1,28,075	,,	,,	—	50/9	Do. C.	..	85—90	...
140,865	,,	,,	—	50/9	New Ordinary	..	87—92	90—91
352,000	,,	,,	6½	53/9	Wimbledon 5 p.c.	117—122	95—100	99—100½
98,000	,,	,,	6½	58/9	Epsom 5 p.c.	121—126	95—100	...
88,416	,,	June 29	3	3%	3 p.c Deb. Stk.	66—69	57—60	...

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Peterborough Gas Prices.—Disappointment was expressed at the last meeting of the Peterborough City Council that the Gas Company had not seen their way to reduce the price charged. The present rate is 4s 2d. per 1000 c.ft., equivalent to 10d. per therm. Having regard to the big decrease in the price of coal, Mr. Slater suggested that gas consumers were entitled to a substantial reduction. A letter was read by the Town Clerk from the Company intimating that there was no intention of increasing the price when the new Order came into operation, the rates remaining the same. No further action was taken by the Council in the matter.

Differential Prices at Stafford.—Alderman Young (the Chairman of the Gas Committee), replying in the Stafford Town Council to certain criticisms with reference to the difference in charges between consumers of gas, said it was the policy of the department to assist manufacturers whenever possible. In the trade of Stafford a large quantity of gas was used, and any increase in the price to big consumers, who were also big ratepayers, would re-act inevitably on employment, and drive trade to other centres. In the course of discussion, it was stated that the price of gas would be considered at the next meeting of the Committee, and that the contemplated reduction (which was not yet fixed) would take effect as from the September readings of the meters.

Recognition of Long Service.—Three employees of the City of Leeds Gas Mains and Distribution Department, whose combined service totalled 127 years, received on Friday, Sept. 29, a handsome clock and walking stick, the gifts of their fellow workmen in the department. The recipients were J. Bone (foreman), A. Newsom (jointer), and T. Smith (labourer)—the two former with 47 years' service, and the last with 33 years. The presentation was made by Mr. Fred Cooper, the Acting Superintendent of the department, who referred to their long and valued services, and expressed regret that Mr. C. S. Shapley (Engineer and General Manager), who would have liked to associate himself with these presentations, was unfortunately unable to attend through being out of town.

Slough and a Therm Inquiry.—When stating in the "JOURNAL" for Sept. 27 (p. 711) that the Slough Urban District Council had decided to ask the Board of Trade to hold an inquiry into the therm system of charging for gas, mention was made of a letter from Mr. W. A. Lidstone, a former councillor, in which he said that his gas bill in one quarter had increased somewhere about £1 on every £3 he paid previously. Mr. Lidstone has since written to the Gas Company: "I find I was under a misapprehension in the statement I made in my letter to the Slough Urban District Council. With reference to my own account, I am satisfied that the increase was attributable to ordinary circumstances." After the taking of the meter readings for the Michaelmas quarter, the price of gas is further reduced. In drawing public attention to these facts, Mr. Arthur Thomas, Secretary of the Gas Company, quotes what Mr. Henry Woodall had to say on the question of the therm at the recent annual meeting of the British Gas Light Company.

Meter Ownership in Bradford.—The Bradford Gas Engineer (Mr. Charles Wood) reported to his Committee recently that a further communication had been received from the Bradford Property Owners' Association with regard to the taking-over of small house meters from owners. The Association asked the Corporation to take over for renewals and repairs all the meters in the city. In view of the policy already adopted of taking over such meters gradually, on request by individual owners, the Committee decided that no further action was necessary. The Property Owners' Association have since advised all their members to make their individual requests to the Gas Department.

When Dominico Cairoli, a waiter at the Hotel Cecil, who lived at Fink Street, Lambeth, was reading in bed, the gas went out, as the slot meter needed further money. Cairoli then turned over and went to sleep. Another lodger came in, put a penny in the meter, and Cairoli was asphyxiated. A verdict of accidental death was recorded at the inquest.

A Ministry of Health inquiry was held at Bingley on the 3rd inst. into the District Council's application for power to borrow £1200 for the installation of a water-gas plant at the Council's gas-works. It was stated that this was necessary to supplement the present gas plant, and furnish a greater supply of gas, particularly for dark foggy weather in winter. There was no opposition.

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The Bradford Gas Engineer (Mr. Charles Wood) has reported to his Committee the necessity for moving gas-mains in Thornton Road, Leaventhorpe, at a cost of £1500, as a consequence of recent road improvements there, carried out as a Government subsidized scheme for the unemployed. In view of the reason for moving the mains, the Committee have instructed the Engineer to endeavour to obtain payment of one half of the cost out of the grant received by the Corporation in respect of these improvements.

Consequent upon the introduction of new carbonizing plant at the Blackburn Gas-Works, several old servants of from twenty to thirty years' standing have been thrown out of work, with little or no prospect of obtaining fresh situations. Their position was mentioned at a Town Council meeting last week, when Mr. Harrison made an appeal on their behalf. He asked if it was not possible for them to be transferred to other departments of the Corporation. Long, faithful service ought to count. Mr. Hamer (the Chairman of the Gas Committee) replied that there were many hard cases. The department had kept as many men as they possibly could, and he did not think they had any control over other departments of the Corporation.

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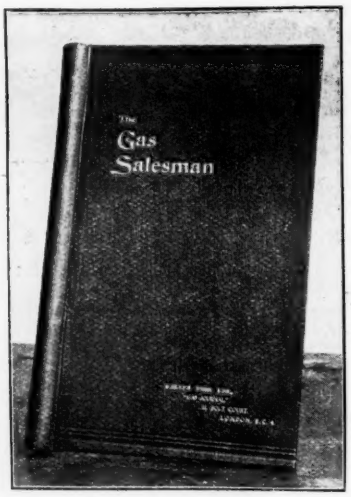

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